MODERN PLASTICS

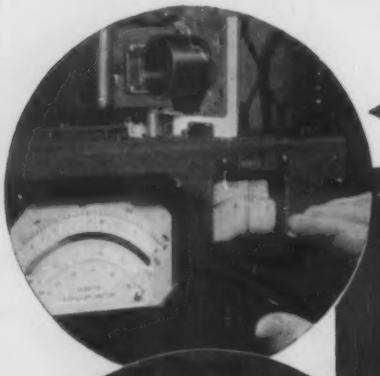
April 1957

page 93 **New markets for plastics in disposable products**

page 123 **How to get better quality in polyethylene extrusion**

improved **all around**

for **all-round** use...



Higher Heat Resistance

Improved Electrical Properties

DUREZ 792

GENERAL-PURPOSE PHENOLIC

Finer Surface Luster

Greater Dimensional Stability

Out of Durez research and testing laboratories has come an important new molding compound—an improved-all-around version of our famous "792."

Molders, designers, engineers, and production men are finding in this material a unique combination of properties at the cost of a general-purpose phenolic.

Heat-resistance is exceptional for a material of its class: when properly molded, "792" successfully withstands in appearance and physical properties a heat treatment of 72 hours at 200° C. (392° F.). Its above-average *insulating properties* are matched by resistance to *prolonged high humidity*.

Dimensional stability is improved over other general-purpose phenolics. These properties, added to its durable high surface gloss, make "792" a most versatile material for applications ranging from camera parts to electronic tube bases, electrical components, and utensil handles. Three granulations include one for preheating volumetric charge for automatic molding equipment. Let us send you a trial shipment and full data.

DUREZ®

Phenolic Plastics that Fit the Job

DUREZ PLASTICS DIVISION

HOOKER CHEMICALS PLASTICS

HOOKER ELECTROCHEMICAL COMPANY

1204 WALCK ROAD, NORTH TONAWANDA, N. Y.

Export Agent: Omni Products Corp., 460 Fourth Avenue, New York 16, New York

every delivery a special delivery

Catalin

RESINS AND CHEMICALS

Catalin produces a wide range of urea, phenolic, cresylic, resorcinol and melamine resin formulations. Modifications of these are also available.

Catalin plastics include polystyrene, polyethylene and nylon molding and extrusion compounds.

Catalin chemical products include antioxidants, oil additives, bacteriostats, alkylation products and special chemicals.

Throughout its three-decade history of growth, Catalin's special goal has been to custom-design *all* its functions . . . research, production and service . . . to the *specific* need of the individual user.

Catalin's laboratories, working closely with customer production teams, have compounded thousands of special chemical and thermosetting resin formulations to meet particular process and product problems.

Strategically located Catalin manufacturing facilities in the East, Midwest and South . . . linked in a sales-office-to-plant teletype network . . . route orders through production with on-the-dot scheduling that achieves customer-delivery neither later nor sooner than desired.

Stainless-steel, insulated trucks, such as those pictured here, transport economical bulk loads . . . safe from contamination . . . with such speed and flexibility that a Catalin customer, whether his need is an emergency one or a routine affair, can count on the promptest cooperation. *Any* order he gives Catalin brings a *special* delivery.

Our technical sales department will gladly discuss the application of custom-compounded resins and chemicals to your special requirements.

CATALIN CORPORATION OF AMERICA

One Park Avenue, New York 16, N. Y.

PLANTS: Fords, N. J. • Calumet City, Ill. • Thomasville, N. C.

MODERN PLASTICS*

Volume 34
April 1957
Number 8

● **Editorial**

5 Year of plastics structures

● **The Plastiscope**

37 Section 1
246 Section 2

● **General Section**

93 Plastics in disposables and expendables
Lower-cost materials, improved materials, and automation in processing are keys to a vast new market

100 Thermoformed scenery for TV
World's largest vacuum forming machine, installed in NBC studio, uses world's widest rigid vinyl sheet

104 See-through hair dryer
Three plastics contribute to appearance and efficient operation of appliance and keep costs in line

106 4 new car parts
A trend toward increased use of reinforced plastics in body components is pointed up by these new applications

109 Luxury look in rigid vinyl
Jewelry counter display case is economically produced by pressure forming and electronic bonding

110 Newest cargo carrier
Huge refrigerated box, designed for rail and highway transportation, holds seven tons of meat

113 Which plastics fastener?
With scores of types and hundreds of sizes available, design engineers today can specify the exact assembly device for any application

117 One-piece phone
With a case molded of styrene copolymer, new simplified instrument combines handset, base, and dial

118 Plastics Products
Clothes hamper; coffee topper; bowling grip; paint brush cleaner; lamp shades; sandbox; float valve; sprinkler

198 What plastics will star at the Brussels Fair?
U. S. pavilion will have major plastics parts

200 Foam in a tube
Polyurethane foam in vinyl tubing is used as weather stripping

202 Plastics in a new electric razor
Decorated acrylic insert gives jewel-like quality to molded acetate case

204 Polyethylene floats
Star-shaped floats reduce evaporation of liquids in open tanks

● **Plastics Engineering**

123 Polyethylene extrusion
Results of experimental examinations of factors affecting dimensional uniformity and mechanical homogeneity
By B. H. Maddock

137 Volume and pressure effects in compression molding—Part II
By W. R. McGlone and L. B. Keller

● **Technical Section**

145 Theoretical study of polyethylene permeability
By Jules Pinsky

158 High-loading-rate tensile properties of thermoplastics
By Stephen Strella and Lucius Gilman

168 Coloring of polyethylene
By F. J. Hines

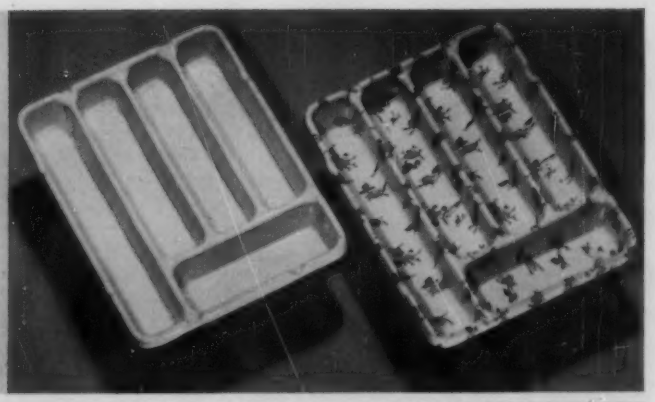
● **Departments**

174 Plastics Digest
180 U. S. Plastics Patents
182 New Machinery and Equipment
188 Books and Booklets
196 Plastics Production
225 Manufacturers' Literature
263 Companies . . . People
282 Classified Advertising
290 Index to Advertisers

Modern Plastics Executive and Editorial Offices: 575 Madison Avenue, New York 22, N.Y.

Modern Plastics published monthly by Breskin Publications, Inc., at Emmett St., Bristol, Conn. Modern Plastics Encyclopedia Issue published as second issue in September by Plastics Catalogue Corp., at Emmett St., Bristol, Conn. Second-class mail privileges authorized at Bristol, Conn. Subscription rates (including Modern Plastics Encyclopedia Issue, which is not sold separately), payable in U.S. currency: In United States, its possessions, and Canada, 1 year $7, 2 years $12, 3 years $17; Pan-American countries, 1 year $10, 2 years $17, 3 years $24; all other countries, 1 year $20, 2 years $35, 3 years $50. Single copies 75¢ each (Show issue, $1.00) in the U.S., its possessions, and Canada; all other countries $2.00 (Show issue $2.50). *Reg. U.S. Pat. Off.

any pattern ▶



◀ any finish

any decoration ▶

now available in Campco sheet

Here's the bright new picture in plastic finishing. Whatever color you want . . . *in any pattern* . . . can now be supplied in CAMPCO sheets. Thanks to a special laminating process, the pattern you need is integrally – and permanently – bonded to the rubber modified styrenc base.

In fact, you can have CAMPCO styrene decorated with any pattern you dream up – or photograph – for less cost than decals or other common techniques of applying designs. Several lively ones already widely used are: wood grains, polka dots, checks, laces and marble. Even simulated *textures,* like leather or cloth can be added by surface embossing. And the sheet can be formed into an almost endless range of products . . . quickly . . . and at low cost.

For data on how these new CAMPCO decorating ideas can make *your* product more attractive and more salable, phone or write today.

CAMPCO DIVISION

CHICAGO MOLDED PRODUCTS CORPORATION

2721 Normandy Avenue, Chicago 35, Illinois • Tuxedo 9-5520

See Campco at the National Packaging Show, April 8-11. Booth #1272 International Amphitheatre, Chicago.

Another new development using

B.F.Goodrich Chemical *raw materials*

purity was the problem... GEON VINYL solved it!

SINCE the fine chemicals processed in this plant react with metallic piping, and thus acquire impurities, a new material was needed.

Piping made from Geon rigid vinyl resin was the logical solution. This durable pipe does not react with the chemicals it carries. It offers superior resistance to oils, acids, alkalis, and most chemicals.

Rigid vinyl pipe of Geon was the *economical* solution too. It weighs only one-fifth as much as steel pipe of similar size, simplifying handling and shipping. It's easily installed, since pipe and fittings are joined quickly with solvent cement.

Geon is a remarkably diverse family of polyvinyl materials . . . star performers for rigid products like piping, valves, housings . . . flexible wall coverings, weatherstripping, foam products . . . coatings for steel, paper, or textiles. One member of the Geon family can surely help *you* make a better product, offer a better value. For information write Dept. FQ-4, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Rigid vinyl piping *at the Rebeis Company, Inc., Berkeley Heights, N. J., handles fine chemicals used in many leading pharmaceutical and cosmetic products. Pipe and fittings for this installation were manufactured by Alpha Plastics Inc., Livingston, N. J.*

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich **GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors**

Editorial

Year of plastics structures

Solemn discussion in smoke-filled rooms at the recent Convention of the National Association of Home Builders pointed up the fact that, on the basis of economics alone, the home building industry is crying for the rapid development of engineering of plastics structures.

All across the country hand-built homes priced from 15 thousand to 40 thousand dollars stand unsold. The prices are too high for the mass purse; taxes are zooming; down payment requirements are steep; mortgage money is getting tighter.

According to the Bureau of Labor statistics, the price of the average home in 1956 was $14,600 — up $2300, almost 20%, from 1954. The reason is found in the rise in material costs and wages in the building industry.

The need for housing remains and is still growing. Requirement estimates for 1957 are in the region of 1⅓ million homes. Concensus of many sources at the NAHB Conference is that little more than one million homes can be started in 1957 with economic justification.

This is probably the greatest challenge the plastics industry has ever faced: the challenge of the composite structure, the sandwich, the bent, the hyperbolic paraboloid, the tension structure. This is the way to prefabrication. This is the way to lower housing costs.

That the public is interested there is no doubt. That the builders are interested was well proved by their reaction to the ideas for plastics use presented to them at the above mentioned conference, especially the plastics kitchens. And the factory prefabricators have long been interested.

For purposes of dramatic promotion the plastics industry has concentrated on the "all-plastics" structure. This, from the standpoints of both engineering function and economics, may be a mistake. Where plastics can best be used with economy, every effort should be made to promote them. Where other materials could better serve, even decoratively, they should be accepted.

Not only the work in hand on the use of plastics in building structures but all previous work on structural elements in aircraft, railroad stock, and refrigeration must be brought together to establish a foundation in literature and experience.

1957 is the year! Non-plastics material costs, labor costs, taxes, and the cost of money all still rise. But the need for quality low-cost housing by prefabrication still grows.

Contents copyrighted 1957 by Breskin Publications, Inc. All rights reserved, including the right to reproduce this book or portion thereof in any form. The name Modern Plastics is registered in the U.S. Patent Office. Printed in U.S.A. by Hildreth Press, Inc., Bristol, Conn. Member, Audit Bureau of Circulations. Member, Associated Business Publications. Modern Plastics is regularly indexed in the Industrial Arts Index and Industex.

Chairman of the board
Charles A. Breskin

President and publisher
Alan S. Cole

Editor
Hiram McCann

Managing editor
A. Paul Peck
Assistant: Monroe Alter

Senior editor
R. L. Van Boskirk
Assistant: Eve H. Marcus

Technical editor
Dr. Gordon M. Kline

Engineering editor
Dr. James F. Carley

Midwestern editor
Val Wright

Associate editors
Joel Frados
Sidney Gross
William Schlefer

Readers service
Phyllis Kahn

Art director
Donald R. Ruther

Treasurer
Ruth Tulbert

Circulation manager
Robert B. Birnbaum

Production
Daniel B. Broads, *director*
Bernard J. Farina
Arthur J. Lilienthal

Promotion manager
Philip W. Muller

Business staff
New York 22, 575 Madison Ave.
Tel., PLaza 9-2710
M. A. Olsen, *general manager*
P. H. Backstrom
B. W. Gussow
S. S. Siegel
R. C. Nilson
B. R. Stanton

Chicago 11, 101 E. Ontario St.
Tel., DElaware 7-0060
J. M. Connors
W. F. Kennedy
H. R. Friedman

Cleveland 22, 20310 Kinsman Rd.
Tel., SKyline 1-6200
R. C. Beggs

Los Angeles 48, 6535 Wilshire Blvd.
Tel., OLive 3-3223
J. C. Galloway

London S. W. 1, England
Panton House, 25 Haymarket
Tel., TRafalgar 3901
T. G. Rowden

Frankfurt am Main, Germany
Wittelsbacher Allee 60
Tel., 46 143/46 372
G. J. Linder

LOOK WHAT THE B&J M-200 (all steel granulator) OFFERS...

1 Grinds all Thermoplastic Materials

Whatever your product, the M-200 takes it in stride and grinds up to 300 pounds an hour. The heavy duty knives with the famous double shear action grind the toughest materials—hot or cold sprues —even vinyl and polyethylene —without fluffing

2 Compact Design — little floor space

The M-200 requires only 24" x 27" floor space—just a few inches more than the smallest grinders. The no-fly-back hopper is set at an easy to feed 49" height. This compact design makes the M-200 ideal for beside-the-press as well as batch grinding.

3 Fastest, easiest cleaning

In seconds, the hopper and screen are detached, exposing the entire interior of the M-200 for quick, easy cleaning. It's simplicity personified! And, the extra heavy all-steel frame of the M-200 is built to last a lifetime. The M-200 cuts down time!

4 Low, low price

With all the advantages the M-200 offers, you'd expect that it would be high priced. But, it isn't! In fact, when you compare feature for feature, you'll find that no other grinder on the market offers so much for so little money!

ALL GOOD REASONS WHY THE M-200 IS THE BEST BUY ON THE MARKET

If you're looking for performance at a low price, the M-200, latest addition to the popular Marvel Line, is the granulator for you. You can make the best test of all right in your own plant —write or phone today for the full details of the B & J 10 day TRIAL TEST PLAN.

5 Plus these other features

Large 8" x 12" throat that handles large area rejects with ease— 3 HP or 5 HP motor with starter —big, smooth sliding bin with large sight glass for fastest, easiest removal of ground material— casters at no extra cost.

STRINGING LONG EXTRUSIONS?

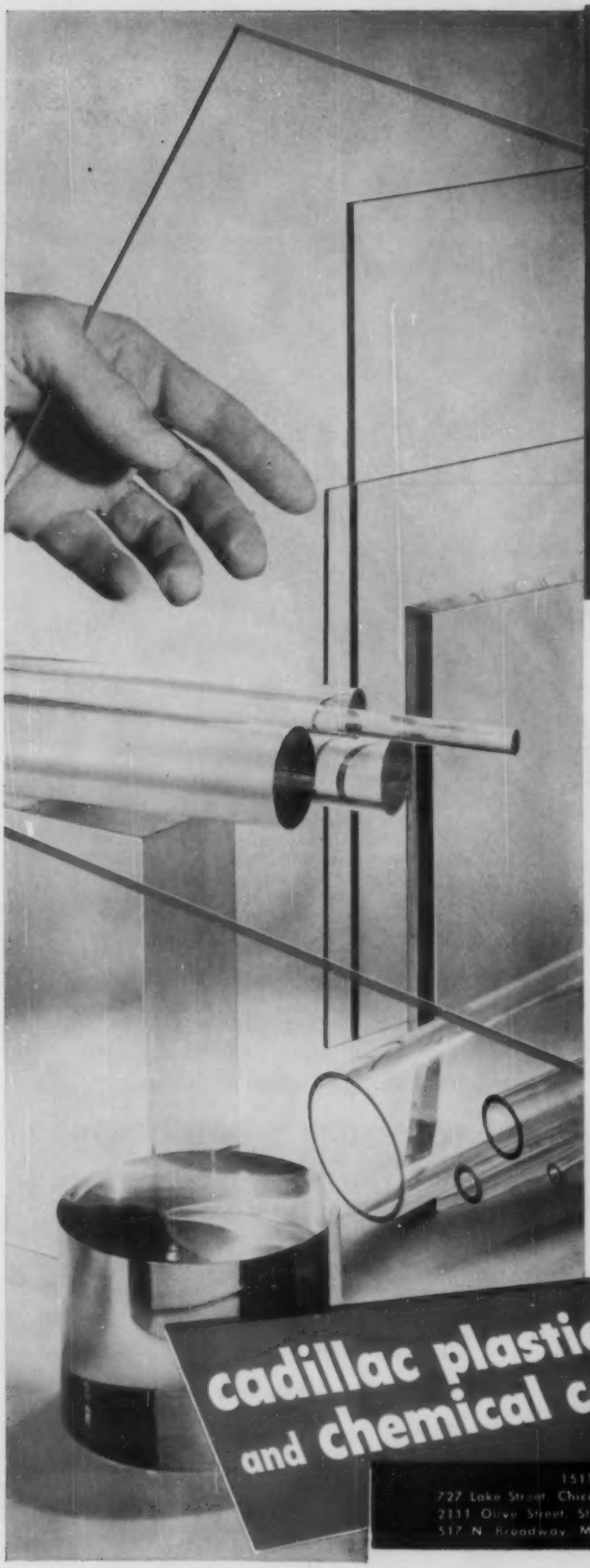
Ask about B & J's new exclusive hopper attachment that handles rejected extrusions, regardless of length, without pre-cutting.

BALL & JEWELL, INC.

22 FRANKLIN STREET EVergreen 9-6580 BROOKLYN 22, NEW YORK

Exclusive Export Distributors: Omni Products Corp., New York, N. Y.

B & J HOPPER HEATER-DRYERS • PNEUMATIC MATERIAL DISCHARGE SYSTEMS



America's Largest Plastic Stocks

PLEXIGLAS®
VINYLITE®
NYLON®
ACETATE®
STYRENE®
POLYETHYLENE®
PHENOLICS®

RODS · SHEETS · TUBES

- **REQUEST CATALOG AND PRICES**

  We can meet your needs for every type of plastic material in any quantity desired.

- **7 FULLY STOCKED WAREHOUSES**

  Regional warehouses carry complete inventories to provide immediate delivery.

- **"CADCO" CAST ACRYLIC RODS, TUBES, BLOCKS®**

  Modern new manufacturing facilities produce a wide variety of "CADCO" rods, tubes and blocks. Material is both transparent and in lustrous colors. Diameters up to 18 inches. "Cadco" is famous for optical clarity, strength and ease of machining.

®Registered Trademarks

Cadillac Plastic and Chemical Co.

Gentlemen. Please send me the following free booklets:

- ☐ Working with Rigid Vinyl
- ☐ 157 Ways to Use Plastics for Maintenance
- ☐ Sq. Inch to Sq. Foot Conversion Table
- ☐ How To Work With Plexiglas
- ☐ Send catalog and prices

NAME_____

ADDRESS_____ CITY_____

COMPANY_____

cadillac plastic and chemical co.

15111 SECOND BLVD., DETROIT 3, MICHIGAN

727 Lake Street, Chicago 6, Ill. • 2305 Beverly Blvd., Los Angeles 57, Calif.
2111 Olive Street, St. Louis 7, Mo. • 652 Polk St., San Francisco 2, Calif.
517 N. Broadway, Milwaukee, Wis. • 3333 Detroit Ave., Cleveland, Ohio

Ideal for handles, grips—the brilliant, lustrous surface finish of Forticel, combined with low thermal conductivity, provide touch comfort. Tough, easily molded over metal inserts, providing excellent retention of metal cores—Forticel adds beauty, precision, longer service life. Molded by A. G. P. Corporation, Peru, Indiana.

PROPERTIES THAT MAKE FORTICEL A MORE DESIRABLE PLASTIC

Flow temperature: (°C.) (A.S.T.M.)	D569-48	167—178
Specific gravity	D176-42T	1.18—1.21
Tensile properties:		
Yield (p.s.i.)	D638-52T	3380—5020
Break (p.s.i.)	D638-52T	3470—5240
Elongation (%)	D638-52T	56—66
Flexural properties:		
Flexural strength (p.s.i. at break)	D790-49T	6400—8500
Flexural modulus (10^6 p.s.i.)	D790-49T	0.23—0.30
Rockwell hardness: (R scale)	D785-51	62—94
Izod impact: (ft. lb./in. notch)	D256-43T	2.7—11.0
Heat distortion: (°C.)	D648-45T	59—70
Water absorption:		
% sol. lost	D570-42	0.00—0.08
% moisture gain	D570-42	1.5—1.8
% water absorption	D570-42	1.6—1.8

BISSELL *selects* FORTICEL

new Celanese propionate thermoplastic to handle its new "Continental" sweeper

The Bissell Carpet Sweeper Co. joins other famous name manufacturers like Zenith and America's leading pen manufacturers in the selection of Forticel for its unique balance of properties—properties that can be counted on to improve finished products—properties that can speed production, cut finishing operations.

Forticel offers the designer and manufacturer the toughness and high speed moldability of the cellulosics. But Forticel offers the big plus combination of: *better dimensional stability, excellent form retention, freedom from unpleasant odor.* Forticel's combined qualities of moldability with superb surface finish, high impact strength with form retention, meet the demands of applications that need *something more* in a thermoplastic molding material.

It's no wonder that within months of its introduction, Forticel established a reputation from top management to the man on the production line, a reputation not only as a designers' and molders' plastic, but as a better production material around which plans can be built and products improved.

If you haven't already evaluated Forticel, we urge you to do so. You will then understand why Forticel, one of the most carefully engineered thermoplastics in use today, is being written into an increasing number of specifications. Celanese Corporation of America, Plastics Division, Newark 5, N. J. Canadian affiliate: Canadian Chemical Co., Limited, Montreal, Toronto and Vancouver.

Celanese
plastics

Celanese® Forticel®

Celanese Corporation of America, Plastics Division
Dept. 101-D, 290 Ferry Street, Newark 5, N. J.

Please send me New Product Bulletin NP-16 on Forticel Plastic.

Name _____ Title _____

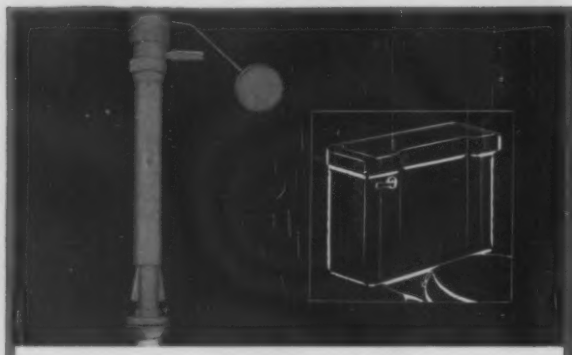
Company _____

Address _____

City _____ Zone _____ State _____

For world-wide list of agents see page 260

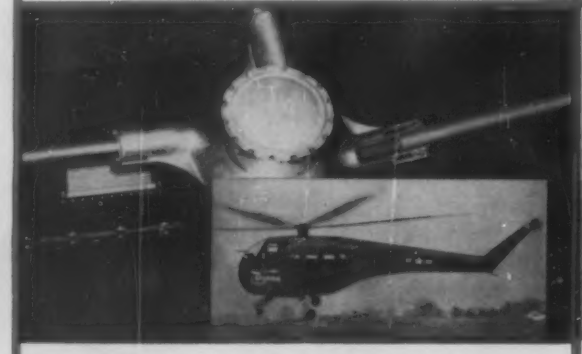
7 more examples showing how makes new products possible



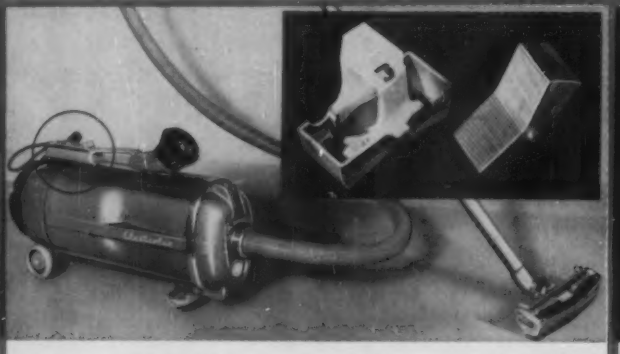
BALLCOCK VALVE of ZYTEL provides a reliable flushing mechanism for toilet installations. Parts of ZYTEL do not corrode even when subjected to underwater conditions and the action of dissolved minerals. (Made by Hydo Valve Corporation, Austin, Texas.)

CYLINDER PLUG for screen, storm door lock is of Du Pont ZYTEL. Entire cylinder is corrosion-resistant, weatherproof and not subject to electrolytic action. Lubrication of plug is not necessary, because ZYTEL nylon resin is a low-friction material. (Manufactured by Taylor Lock Company, Philadelphia 32, Pennsylvania.)

ROTOR AND GRILLE of hair dryer are molded of ZYTEL nylon resin. The thin-walled, intricate parts have high strength. (Rotor by Master Appliance Manufacturing Co., Racine, Wisconsin; grille by Wilmington Plastics Co., Wilmington, Delaware. Molded for Saxony Electronics, Inc., Wilmington, Delaware.)



SLEEVE BEARING of Du Pont ZYTEL supports spar tube in arm of helicopter rotor hub. Abrasion resistance and toughness of ZYTEL enable it to outperform conventional bearing materials. (Made by Doman Helicopters, Inc., Danbury, Connecticut.)



FOOT-SWITCH COMPONENTS made of Du Pont ZYTEL provide high impact strength, excellent insulation, resistance to heat. (Vacuum cleaner by Electrolux Corporation, Old Greenwich, Connecticut; switch parts by Mack Molding Company, Inc., Arlington, Vermont.)

Du Pont ZYTEL® nylon resin ...existing products better

THE 7-TRANSISTOR portable pocket radio (Model Royal 500) shown above has an unbreakable casing of ZYTEL nylon resin. The smooth, gleaming finish of ZYTEL provides special sales appeal. (Manufactured by Zenith Radio Corporation, Chicago; case molded of ZYTEL by Plastic Molded Products Co., Chicago, Illinois.)

BOLTS AND SCREWS are self-locking, thanks to inserts of Du Pont ZYTEL nylon resin. Fastenings are highly resistant to vibration. Durability of ZYTEL permits repeated use of the parts. (Made by The Nylok Corporation, Paramus, New Jersey.)

• Outstanding designs in every branch of industry have been made possible by Du Pont ZYTEL. A few of the latest products that use ZYTEL are shown in these illustrations. They represent applications in electronics, hardware, appliances, building supplies and aviation.

In many products, appearance is a prime consideration. The portable radio and the hair dryer are examples of this. The beauty and richness of finish provided by ZYTEL make it a natural choice for these products.

In other cases, the low-frictional surface and abrasion resistance of ZYTEL are of great importance. ZYTEL was selected for the helicopter and the door lock because of these qualities.

In every instance, the strength and toughness of Du Pont ZYTEL are foremost in meeting design requirements. ZYTEL is a tough, resilient, nonbrittle material. Rugged machine parts such as gears, cams and bearings are made of ZYTEL.

ZYTEL can be molded into precise, intricate shapes. Parts can be mass-produced by economical injection molding or machined from extruded stock. Usually, no further finishing process is required after molding.

If you need a strong, high-quality material for your components, it will pay you to investigate Du Pont ZYTEL. Simply mail the coupon, and informative literature will be forwarded to you.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.),
Polychemicals Department
Room 194, Du Pont Building, Wilmington 98, Del.
In Canada: Du Pont Company of Canada (1956) Limited,
P. O. Box 660, Montreal, Quebec

Please send me more information on Du Pont ZYTEL nylon resin.

I am interested in evaluating this material for

*Name*_____

*Position*_____

*Firm Name*_____

*Street Address*_____

*City*_____ *State*_____

*Type of Business*_____

Prompt SERVICE at your

We carry the following plastic in stock—for all your immediate needs!

PLEXIGLAS

Standard Type II UVA
Also Type "R"—the lower priced
Acrylic sheet
Masked and Unmasked

VINYLITE

Rigid and Flexible
Clear—Colors—Calendered—Matte

CELLULOSE ACETATE

Clear—Colored—Matte—Extruded

ACETATE BUTYRATE

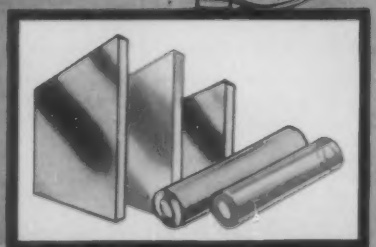
Polished—Extruded

POLYSTYRENE

Natural—Colored

POLYETHYLENE

.015 thru .125 thicknesses
Large Sheets



TRANSILWRAP COMPANY

Write for Informative Free Booklets

2814 WEST FULLERTON AVE. · Dickens 2-2616 · CHICAGO 47, ILLINOIS

EASTERN DIVISION: 1647-49 HENVIS · Michigan 4-2241 · PHILADELPHIA 40, PA.

"Seeing is Believing"

POLYETHYLENE FILM
with CELLOPHANE CLARITY

PRODUCED AND TREATED FOR PRINTING
exclusively with ....

modern plastic machinery corp. **EQUIPMENT BY**

For The Best Products . . .
Get The Best Equipment!

Only WITH **MPM** EQUIPMENT CAN
YOU PRODUCE FILM LIKE THIS!

modern plastic machinery corp.
Manufacturers and Designers of
THE MOST ADVANCED PLASTIC PROCESSING EQUIPMENT
15 Union St., Lodi, N. J., U.S.A. • Cable Address: MODPLASEX
IN USE IN THE UNITED STATES AND THROUGHOUT THE WORLD

West Coast Representative: 8510 Warner Drive, Culver City, Calif.

It's the hottest thing

Photo courtesy Blackman Plastics Company, Culver City, California Fireban—T. M. Charles Crowl Company, El Monte, California

in flame-resistance

They call it Fireban. And it's the latest answer to the need for an improved, flame-resistant, stress-relieved, thermoplastic sheet for aircraft, automotive and industrial applications.

Fireban is a totally different rigid sheet. Using a different approach in pigments and flame suppressants, it is translucent and considerably lighter in weight than similar materials. It also exhibits greater impact resistance plus high tensile strength and a high heat-distortion point. Yet it is readily formed and mechanically worked by any conventional method.

Because of its unusual physical and processing properties, Fireban has many uses, especially in the transportation field. Some of these include window frames (pictured at left), wall panels and seating for aircraft and trains; kick panels for cars, liners for refrigerated trucks plus instrument housings and other interior parts for all types of vehicles.

The exact composition of this new kind of plastic sheet has not been disclosed by the manufacturer, but it has been described as a unique alloy of vinyl and styrene resins. It also has been revealed that PLIOVIC is the vinyl resin used.

PLIOVIC was chosen because of its uniformity, rapid processing, and the superior physical properties it imparted to the end product. Another factor in its selection was the outstanding assistance rendered by representatives of the Goodyear Chemical Division.

Flame-resistant sheet is just one of many uses for the several types of PLIOVIC currently available. Wherever you need a high-quality vinyl resin, be sure to sample PLIOVIC and the service that goes with it. You can start today by writing for details plus the latest *Tech Book Bulletins* to: Goodyear, Chemical Division, Akron 16, Ohio.

PLASTICS DEPARTMENT

CHEMICAL GOODYEAR DIVISION

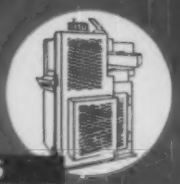
CHEMIGUM • PLIOFLEX • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS

High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries

Chemigum, Pliolite, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

In Plastics Reducing Machinery, Look to CUMBERLAND for the COMPLETE LINE

GRANULATORS



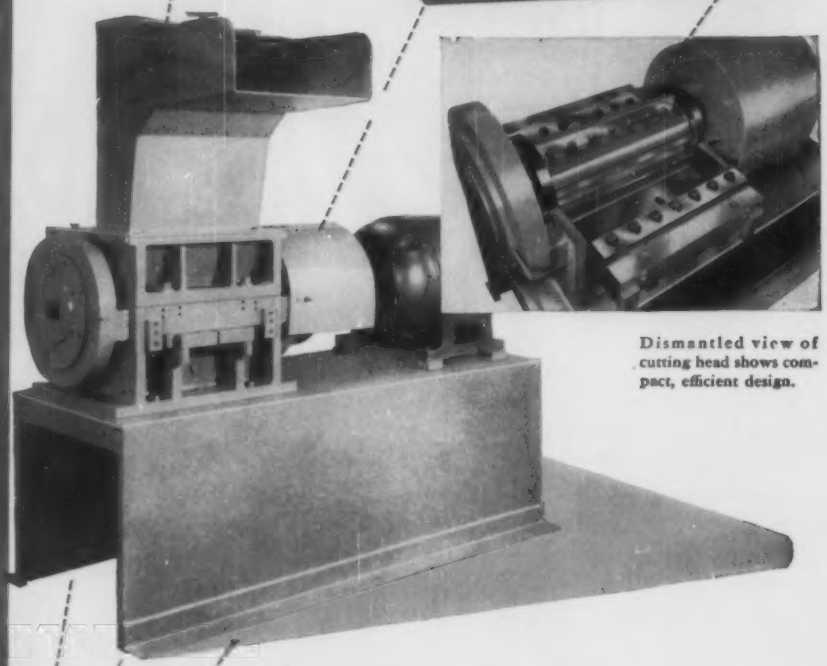
DICERS

CHOPPERS

PREBREAKERS

MODEL 20 All Steel Granulator

CUSTOM ENGINEERED
QUALITY BUILT



Dismantled view of cutting head shows compact, efficient design.

1 HEAVY DUTY — Large flywheel—thick all-steel weldments—deep welds—parts are of flawless wrought steel (not steel castings)—machine resists wreckage.

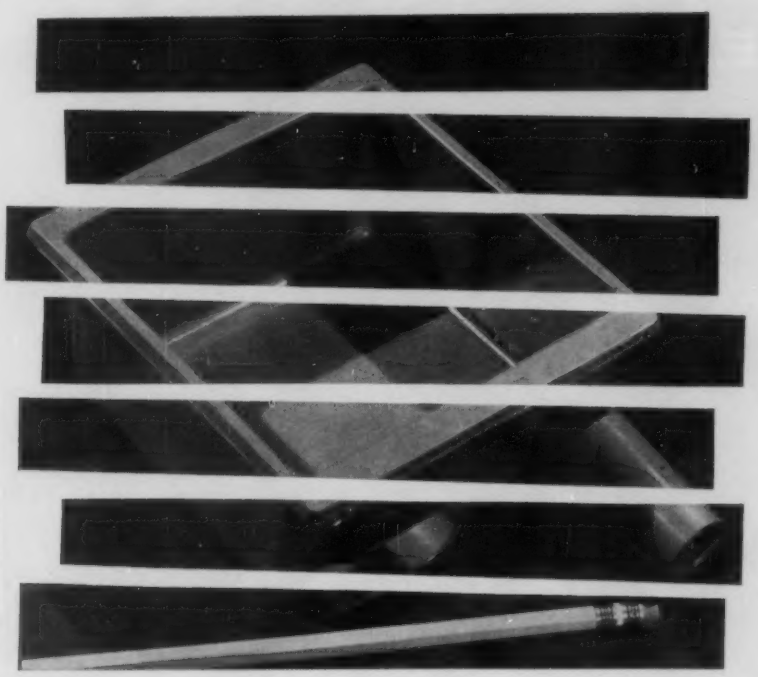
2 LARGE THROAT OPENING — 8 by 20" size.

3 PRIOR BANDSAWING NOT NEEDED — Machine specially built to handle large chunky parts such as bleeder scrap, cylinder purgings and heavy cast slabs of polystyrene, modified polystyrene and acrylic resins.

CUMBERLAND

BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
4113 West Jefferson Blvd., Los Angeles 16, Cal.

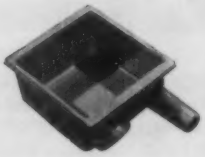


take another look...
at plastic molding insurance!

Continuous production of your plastic moldings at Kurz-Kasch is insured by (1) a stand-by power system for our molding presses; (2) a policy of designing dies that will last; (3) a staff of top-notch tool makers to keep dies in shape; (4) two generations of specializing in thermo-setting plastic moldings. We know more ways to stay out of trouble than some molders know how to get in.

The dishwasher part shown meets a trick set of specs: smoothness for appearance; glass reinforcing for high impact; good resistance to hot, soapy water; color to match attractive trim.

For a quote you can depend on . . . call Kurz-Kasch.



Specialists in thermo-setting plastics for 41 years

kurz-kasch

1415 South Broadway, Dayton 1, Ohio

SALES OFFICES—New York, Mt. Vernon, Mo 4-4866; Rochester, Hillside 0626; Beverly, Mass., Walker 2-0065; Chicago, Merrimac 7-1830; Detroit, Jordan 6-0743; Philadelphia, Hilltop 6-6472; Dallas, Lakeside 6-5233; San Gabriel, Cal., Atlantic 7-9633; St. Louis, Parkview 5-9577; Atlanta, Cedar 7-5516; Toronto, Can., Oliver 7988

*TRADEMARK FOR W. R. GRACE & CO'S POLYOLEFINS

W. R. GRACE & CO.
Polymer Chemicals
DIVISION
Clifton, N. J. Baton Rouge, La.

Odd spot for a sales meeting . . . unless, with us, you believe plastic sales should begin with applications research *by the resin producer himself*. At Polymer Chemicals Division, the Applications Research Laboratory is fully equipped and humming as we mold, extrude, laminate and otherwise test-process new GREX resin. The purpose . . . new, better products made with GREX by you. Better products . . . better *sales*.

Plastic Products
.... a combined Achievement of Chemistry and Machine Building

In close cooperation with the Chemical Industry we have developed complete extrusion installations for the manufacture of plastic pipe, film, sheet, shape, filaments and others.

The technique of processing plastics on extrusion machines is gaining in importance every day. In this particular field REIFENHAEUSER extruders and packaged extrusion plants have made a world-wide name for themselves.

Today they are first choice of every manufacturer of plastic products.

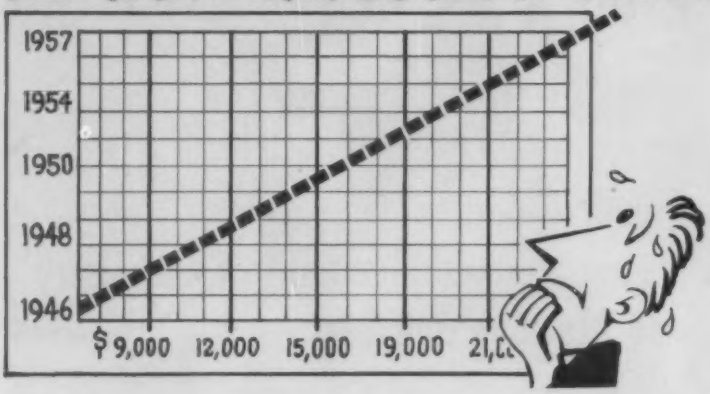
BOPP

A·Reifenhäuser
MASCHINENFABRIK

TROISDORF
West Germany

Representative for sales and service in USA:
H. H. HEINRICH, INC.
111 Eighth Avenue, NEW YORK 11, N.Y.

AS NEW INJECTION PRESS COSTS CLIMB



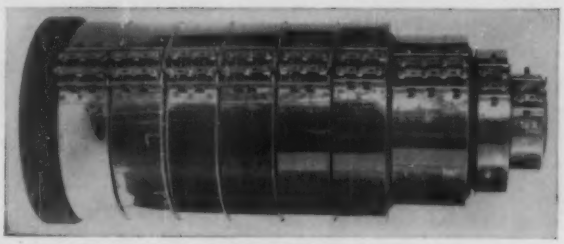
IT BECOMES MORE IMPORTANT THAN EVER TO KNOW JUST HOW MUCH LIFE IS LEFT IN YOUR OLD INJECTION MACHINE

With New Equipment Costs Sky-Rocketing
Smart Molders Are Checking on Overhaul and Modernization

IMS REPLACEMENT HEATING CYLINDERS CAN OFTEN MAKE YOUR OLD PRESSES FULLY COMPETITIVE AGAIN!

Yes — an overhaul, a tune-up, clean oil, and perhaps an extra oil cooler — a few thousand invested in your old press may save you a fortune in new press costs, because old machines can often be made fully competitive again! Let us review your old equipment before you decide to scrap it. We'll tell you just what it will do with an IMS Extra Capacity Superheater in place of the old outdated one — and with New IMS Thermastrip Full Circle Extra Wattage Replacement Heater Bands, of course!

WRITE OR PHONE TODAY!



Illustrated: New IMS Thermastrip Replacement Heaters on IMS Reed-type 10E 16 Replacement Cylinder

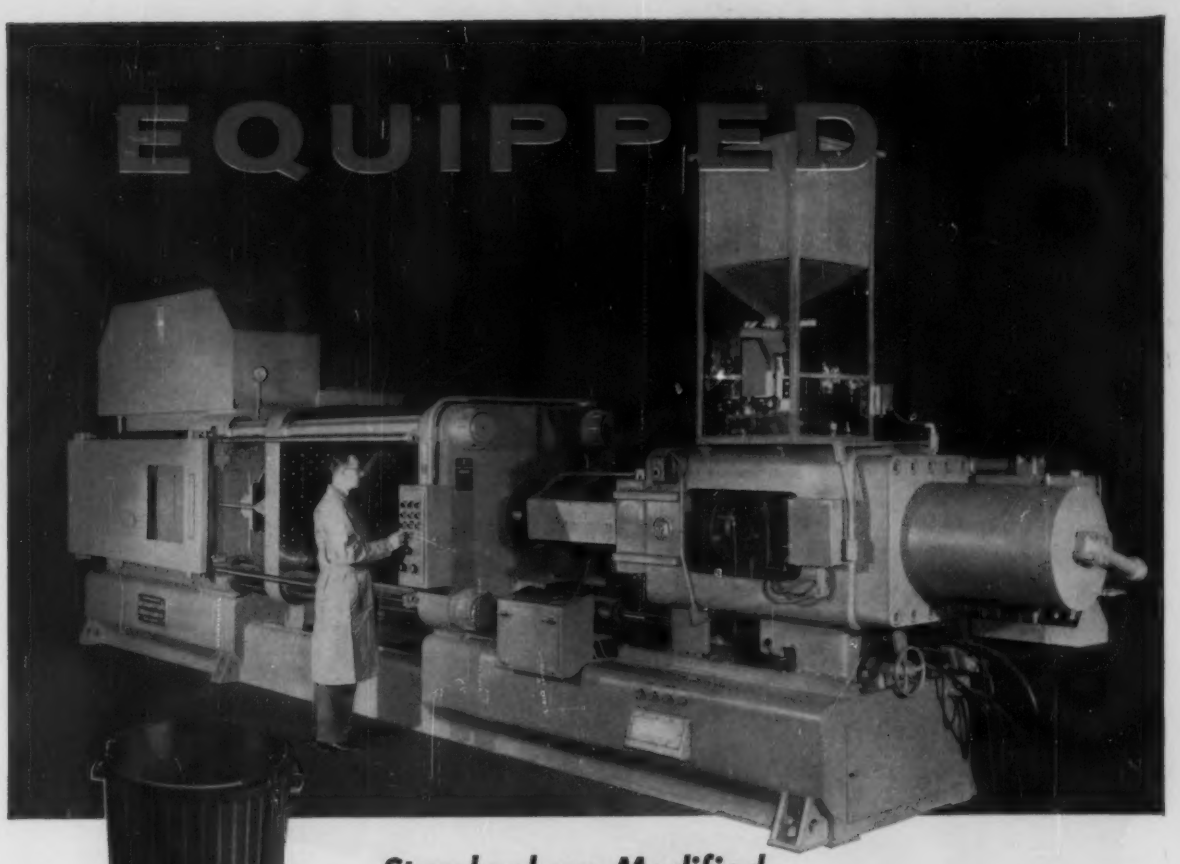
Illustrated: New IMS Thermastrip bands showing details of construction, including grooved aluminum shoe and tubular elements.

IMS
INJECTION MOLDERS SUPPLY CO.
3514 LEE ROAD • CLEVELAND 20, OHIO
WYoming 1-1424

Meet Rising Press Costs with IMS EXTRA CAPACITY SUPERHEATERS PLUS. . . .

IMS THERMASTRIP HEATER BANDS

(The Band with the Heat Reservoir — for Even Heat on Cyclical Use)



Special H-P-M 48/64 oz. injection machine with 84" daylight and 54" stroke. Ideal for deep parts like the LOMA 20½" tall waste basket above.

Standard or Modified,
H-P-M *Can Handle Your Needs*

H-P-M has a complete range of standard injection machines for normal requirements. For those jobs needing special equipment, here's what we can do for you:

- **Furnish standard machines with additional stroke and daylight.**
- **Special heating chambers for higher or lower injection pressures.**
- **Higher speed injection for special molding jobs.**
- **Furnish special electrical controls.**
- **Design special automatic cycle features.**

H-P-M, as one of the pioneers, has been building molding machines since the Plastics Industry was in its infancy . . . for 80 years we have been manufacturing all types of special hydraulic machinery. We have the technical knowledge and modern plant facilities second to none. If you have a special problem, write or phone today.

THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.
A DIVISION OF KOEHRING COMPANY

HPM

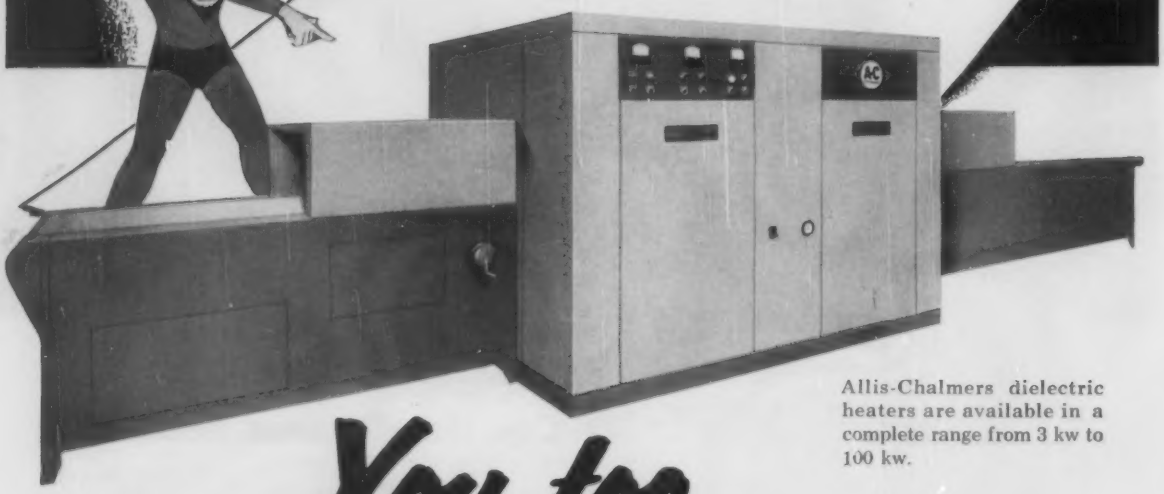
1877—1957

ALLIS-CHALMERS

Dielectric Heaters

The application list is growing...

- ✓ Drying cellulose sponge
- ✓ Setting resin adhesives for wood bonding
- ✓ Gelling, curing, drying foam rubber
- ✓ Drying crumb rubber for Mooney test control
- ✓ Curing resin-impregnated paper
- ✓ Setting twist for rayon cord
- ✓ Heating plastic preforms
- ✓ Laboratory and research projects



Allis-Chalmers dielectric heaters are available in a complete range from 3 kw to 100 kw.

You, too, can

cut costs • save space • speed production with Allis-Chalmers dielectric heaters

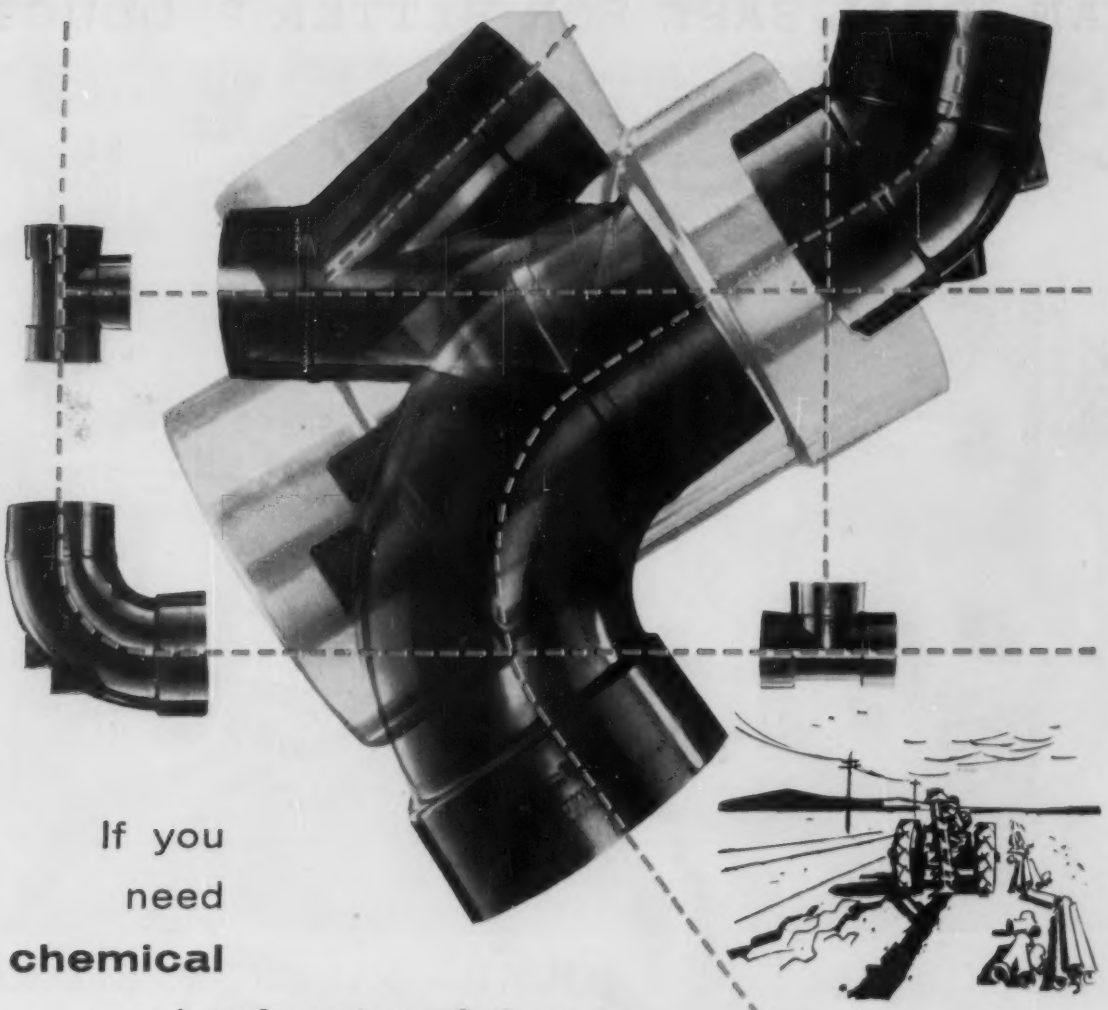
Processing time measured in minutes . . . maximum production per unit of floor space . . . streamlined work flow . . . minimum heat loss . . . improved working conditions . . . simplified operation — these advantages are yours with the Allis-Chalmers dielectric heater.

If your processing requires the heating of non-conducting materials, the application of Allis-Chalmers dielectric equipment and engineering will mean faster production and lowered costs. The experience gained by Allis-Chalmers engineers in designing hundreds of dielectric and induction heating installations is available for your operations.

See your nearby Allis-Chalmers representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. Ask for bulletin 15B6431C.

ALLIS-CHALMERS

A-5303



If you
need
chemical
and **solvent resistance**
...count on **Plenco**

PIPE GOING IN—into earth potent with destructive forces: Water, solvents, acids and alkalies; salts, fungi, bacteria and electrolytic action. That's why special Plenco formulations are being used for the production of underground pipe drain fittings.

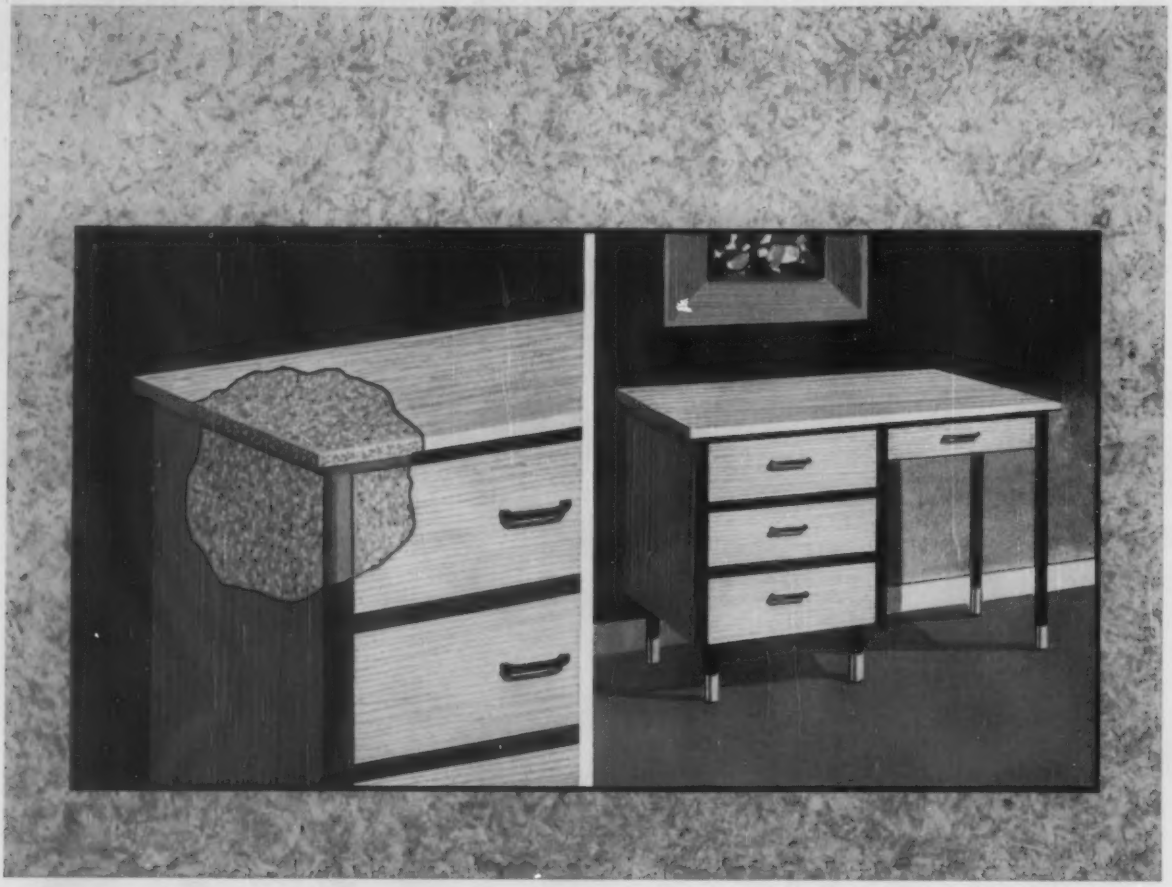
Of course, no one material can give complete protection from all these factors in all degrees, indefinitely. Plenco phenolic molding compounds, however, have much to offer on applications of this type and others. Their insoluble, infusible and chemical resistant character has shown an increasing variety of manufacturers that you can count on Plenco.

PLENCO PHENOLICS
FOR BETTER PLASTIC PRODUCTS

PLASTICS ENGINEERING COMPANY
Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

AN IDEAL BASE FOR BETTER PRODUCTS



WEYERHAEUSER 4-SQUARE PARTICLE BOARD—
ideal for decorative plastics and wood veneers

A SMOOTH surface plus a beautiful finish. Here are two of the most important factors in helping any product sell. And, you will find that Weyerhaeuser 4-Square Particle Board when used as a base helps you to do an outstanding job on both these vital counts!

Because it is a manufactured product, 4-Square Particle Board offers greater advantages in the special characteristics you require in a core material. These built-in advantages include: freedom from grain and knots which means that wood veneers or decorative plastics can be laminated without "mirroring". 4-Square Particle Board is easy to work with the same machines and tools as wood. Both sides are smoothly sanded. Panels come in standard sizes or cut to your specified sizes.

Here is the ideal core material for tops, end panels and drawers of furniture; for dinette table tops, sink and counter tops; cabinet and sliding doors. Available in $\frac{3}{8}$" to 1" thicknesses and in densities for 3 and 5 ply use. Send for sample now.

Weyerhaeuser offers Hardboards, too . . . to meet a wide range of needs. Write for descriptive literature.

Weyerhaeuser Sales Company
DEPARTMENT PJ-47
First National Bank Building • St. Paul 1, Minnesota

Have you seen this Kit?

Shows actual samples of plastics and veneers mounted on 4-Square Particle Board with various types of edging. Your Weyerhaeuser salesman will be glad to show it to you on his next visit!

Pioneered and developed by RADIO RECEPTOR ...Now protected by new U.S. patent!*

Thermatron®

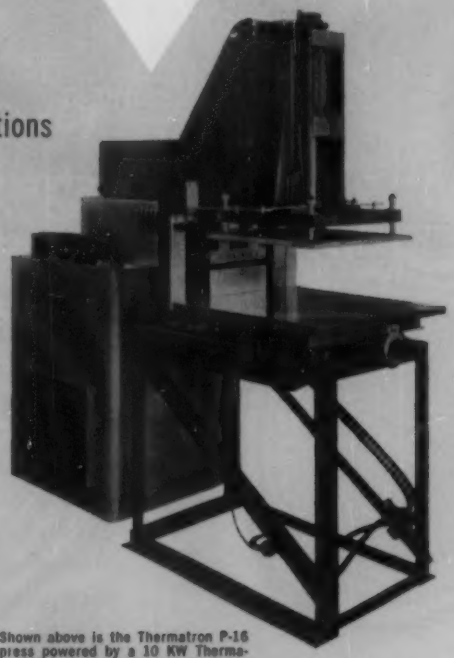
automatic electronic ARC SUPPRESSOR

Eliminates flare-ups in plastic welding operations

Radio Receptor engineers devoted a great deal of research to the problem of "arcing" and the newly patented Thermatron Arc Suppressor is the result — *still* the most advanced unit of its type! By anticipating any arc *before* occurrence it saves expensive equipment and materials. Spoilage is reduced and production speeded up considerably!

Because of exclusive design features which cannot be copied, the Thermatron Arc Suppressor offers a safety and dependability not found in similar devices. Small, compact and efficient, it is easily installed on any Thermatron generator. Takes no extra floor space. Our engineers will be glad to explain this refinement in plastics welding. Write for complete details to Dept. 111.

*U. S. Patent #2,763,750



Shown above is the Thermatron P-16 press powered by a 10 KW Thermatron electronic generator, #K 1005— all completely automatic even to the Thermatron Arc Suppressor which cuts off the power before arcing occurs. A light indicates that the unit has operated, plate and grid line are broken and the generator resets itself for the next operation.

Radio and Electronic Products Since 1922

Thermatron Division
RADIO RECEPTOR COMPANY, INC.
Sales Offices: 251 West 19th Street, New York 11, N. Y. • Telephone: WAtkins 4-3633
Chicago 47: 2753 West North Ave.; Los Angeles 22: R.A. Sperr, P.O. Box 6878
St. Louis 19, Mo.: R. E. Fisler, 225 Baker Ave., Webster Groves • Factories in Brooklyn, N. Y.
Other Radio Receptor Products: Radar, Navigation and Communications Equipment, Selenium Rectifiers, Germanium and Silicon Diodes

Are you measuring all the muscles in your base fabrics?

Fabric breaking strength is frequently given too much importance, when it is just one of at least seven kinds of strength that contribute to end-product performance!

Over-emphasis on one kind of strength can give a misleading picture of how a fabric-reinforced plastic or rubber product will behave. Depending on end use, the impact, shear, flex, tear, burst or stitch strength can be just as decisive as breaking strength. All together, they permit a much more dependable estimate of product capabilities.

When your base fabric is one of the many provided by Wellington Sears for coating, laminating, combining and rubberizing, you know that its strength *and all other properties* have been considered in the light of your specific need. And moreover you know that a century of experience is working for you, to anticipate and help solve your working-fabric problems.

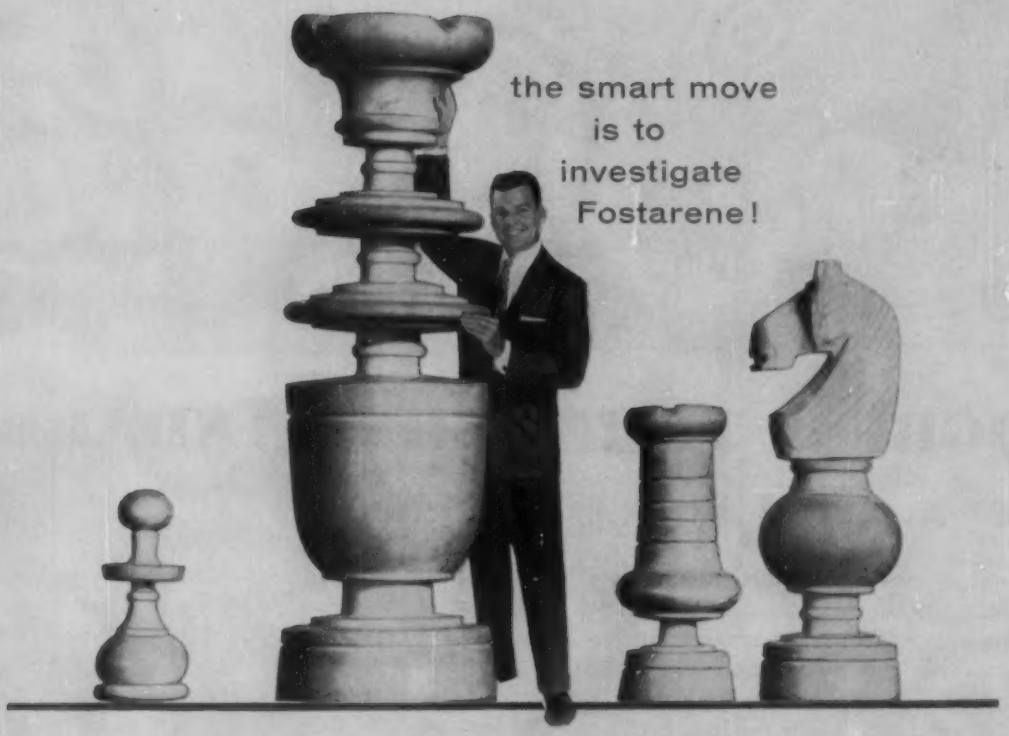
New Booklet Now Ready! Write Dept. K-4, for "Fabrics Plus"

Wellington Sears

FIRST In Fabrics For Industry

For Coated Materials, High and Low Pressure Laminates and Other Reinforced Plastic Products

Wellington Sears Co., 65 Worth St., New York 13, N. Y. • Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis



You've got a molding problem! You want a polystyrene that's more durable, more lustrous, more dependable in its yield of perfect pieces.

Have you looked into Fostarene?

Fostarene is a product of a pioneer in plastics for over 30 years. In talent and equipment, Fostarene's research facilities are second to none . . . *and growing!*

The result: Better performance, better service for more and more molders who have made the discovery *you* can make—that when it comes to polystyrene, the smart move is to investigate Fostarene.

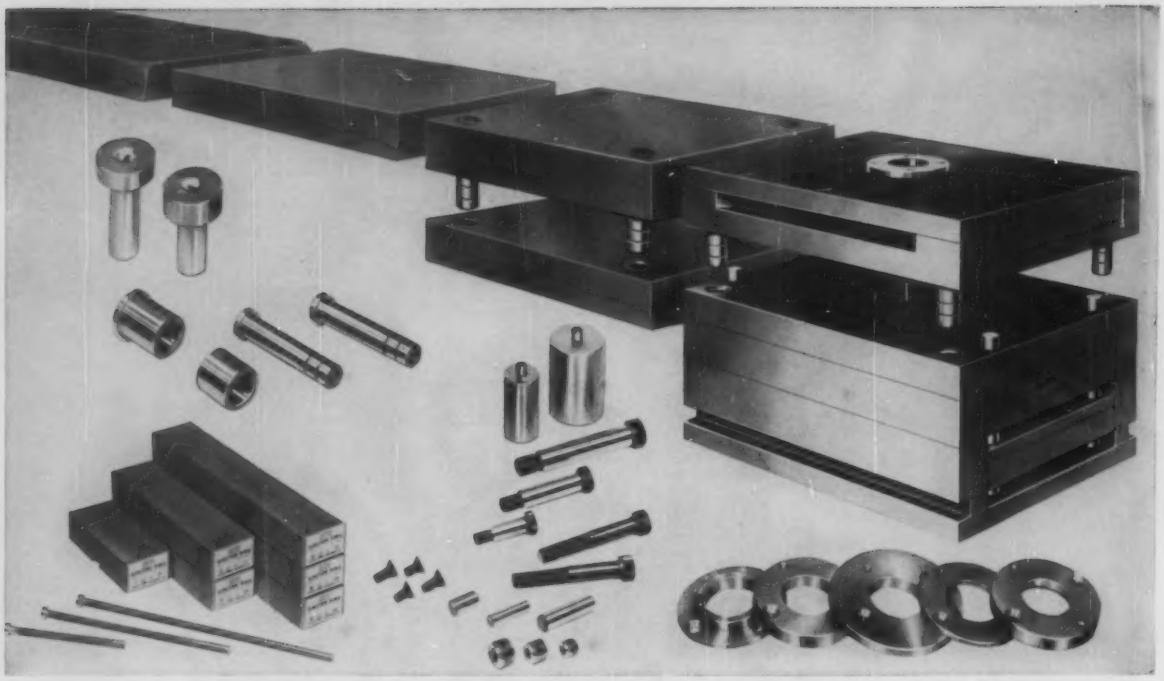
FOSTARENE

STYRENE PLASTICS • GENERAL-PURPOSE • HIGH IMPACT • HIGH FLOW

AVAILABLE IN PELLETS, GRANULES AND FINE GRIND FOR DRY COLORING . . . IN CRYSTAL CLEAR AND A FULL RANGE OF CUSTOM COLORS

EXCLUSIVELY REPRESENTED BY: H. MUEHLSTEIN & CO., INC. 60 E. 42nd St., N.Y. 17
BRANCH OFFICES: AKRON • CHICAGO • BOSTON • LOS ANGELES •
WAREHOUSES: AKRON • CHICAGO • BOSTON • LOS ANGELES • JERSEY CITY

MANUFACTURED BY: FOSTER GRANT CO., INC., PETROCHEMICAL DIVISION
MONOMER PLANT, BATON ROUGE, LA. • POLYMERIZATION PLANT, LEOMINSTER, MASS.
A PIONEER IN PLASTICS FOR OVER THIRTY YEARS



PROGRESS THROUGH STANDARDS

. . . and how DME "helped"

The history of economy in modern business has been directly related to the history of Standardization. One of the major elements affecting the economic production of finished plastic parts is the high initial cost of the mold. A progressive step in reducing mold cost, without sacrificing the high quality required, has been successfully achieved through Standardization.

When D-M-E originated Standard Mold Bases and their component parts in 1942, it provided the answer to the rapidly growing demand for high quality molds that would maintain and promote the economic advantages of plastic parts.

Through large volume purchases of quality steel in standard sizes and specialized production facilities, D-M-E was able to produce and supply high quality Standard Mold Bases to mold makers and molders at such great savings in cost and time that the benefits of Standardization were quickly realized by the Industry.

Today D-M-E produces twenty-two different sizes of Standard Mold Bases, from 9" x 8" to 18" x 35½", in either D-M-E No. 1 or No. 2 Steel, with a wide range of cavity plate thicknesses to satisfy the diversified demands required. In addition, over 2,000 finished component parts of the same high quality are available to provide additional savings in service as well as in the product.

Properly engineered Standardization puts the accent on Economy. When you "Specify D-M-E . . ." you get Quality, Service AND Economy!

Specify **D-M-E**
for
QUALITY . . .
SERVICE . . .
ECONOMY!

DETROIT MOLD ENGINEERING CO.
6686 E. McNICHOLS ROAD — DETROIT 12, MICHIGAN — TWinbrook 1-1300
Contact Your Nearest Branch FOR FASTER DELIVERIES!

HILLSIDE, N. J. (NEAR NEWARK) 1217 CENTRAL AVE., ELIZABETH 3-5040
CHICAGO 51, ILLINOIS 5901 W. DIVISION STREET, COLUMBUS 1-7855
CLEVELAND 9, O. - D-M-E CORP. 502 BROOKPARK RD., SHADYSIDE 1-9202
LOS ANGELES 7, CAL. 3700 SOUTH MAIN STREET, ADAMS 3-8214

Save time, money, storage space with—

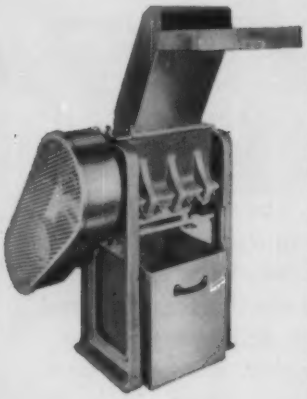
DE MATTIA GRANULATORS

PROCESS ALL YOUR SCRAP

With De Mattia Scrap Grinders in your molding shop you can reclaim all your scrap—large chunks from heating cylinders, accumulations from nozzles and real tough molded pieces—in your own plant, at once. Available for press-side installation save handling and make salvaged material immediately available. There is a De Mattia model for every scrap processing need.

WRITE FOR NEW ILLUSTRATED BULLETINS ON DE MATTIA GRANULATORS AND HIGH EFFICIENCY INTERNAL MIXERS — Contain complete specifications on famous De Mattia molding equipment.

GRANULATOR No. 1



Simple, rugged and highly efficient. Has capacity of 200 lbs. per hour. 3 H.P. Motor with double V belt and Meehanite flywheel. Features high grade roller bearings with positive seal. Four cutting blades placed on a bias permit efficient cutting of thin strips in Vinyl, Saran, etc. Standard screen with ¼" openings (other screen sizes on request). Hopper opening 13¼" x 4½". Floor space required 32" x 44"; net weight with motor (approx.) 800 lbs.

GRANULATOR No. 3

For low-cost salvage of the large slugs and chunks resulting from cleaning out the heating cylinder, accumulation at the nozzle and also those molded pieces too tough for the average sprue and scrap grinder. Capacity — Over 150 lbs. per hr. 3 H.P. Motor in Base. Double V Belt Drive. Heat treated Alloy Steel Rotor High Grade Roller Bearings with Positive Seals. Standard Screens with 11/32" Openings (other sizes on order). Hopper opening 9" x 4¼".

GRANULATOR No. 4-A

Recommended for at-the-machine operation. Capacity 75 lbs. per hour; 2 H.P. Motor 1200 RPM; Direct drive; Solid semi-steel hopper; High grade roller bearings with positive seals; Standard screen with 11/32" opening (other sizes on order). Hopper opening 9" x 4¼". Overall dimensions 39" long, 18" wide, 42" high. Net weight 500 lbs. with base.

DE MATTIA MACHINE and TOOL CO.

DE MATTIA MACHINE and TOOL CO.

CLIFTON • NEW JERSEY.

"Keep the change!"

Impossible? Well, perhaps it is. We'll have to admit we've never yet had any of our customers—Scotch or otherwise—offer to pay more than we billed them.

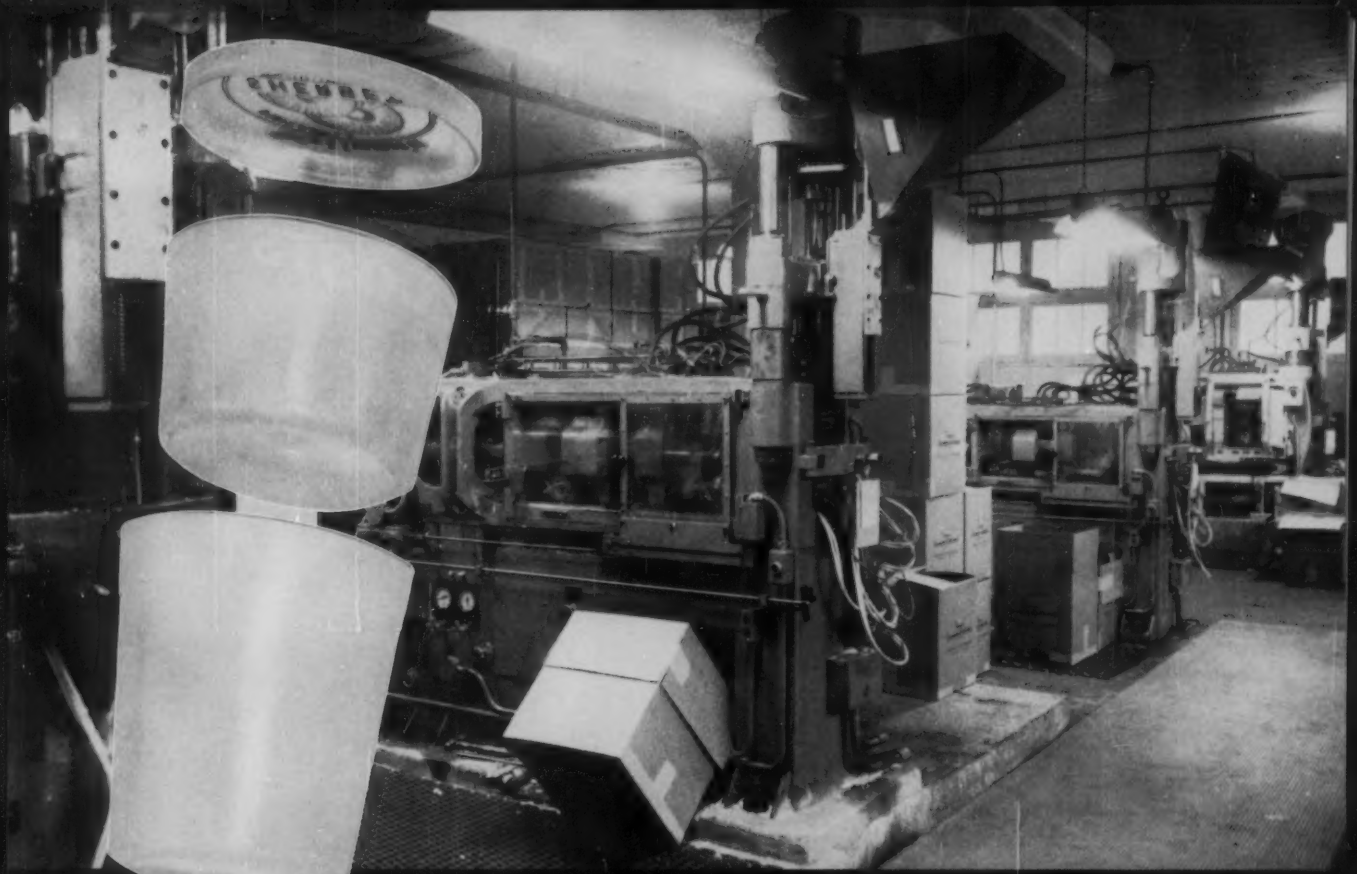
Nevertheless, in the business of buying molded plastics, a dollar goes further in some plants than in others. The molder who really knows his business can stretch a customer's buck over a lot of territory by careful materials selection, sound production technique, and proper job scheduling. At Boonton, we cover all these bases thoroughly, and we're especially careful about the pesky items—like scrap control and packaging—that have a nasty way of swelling costs unless they're watched carefully.

Next time you're especially concerned about getting good value for the money you spend on molded pieces, give the job to Boonton. After you get your bill, maybe you'll be the one to tell us to "keep the change."

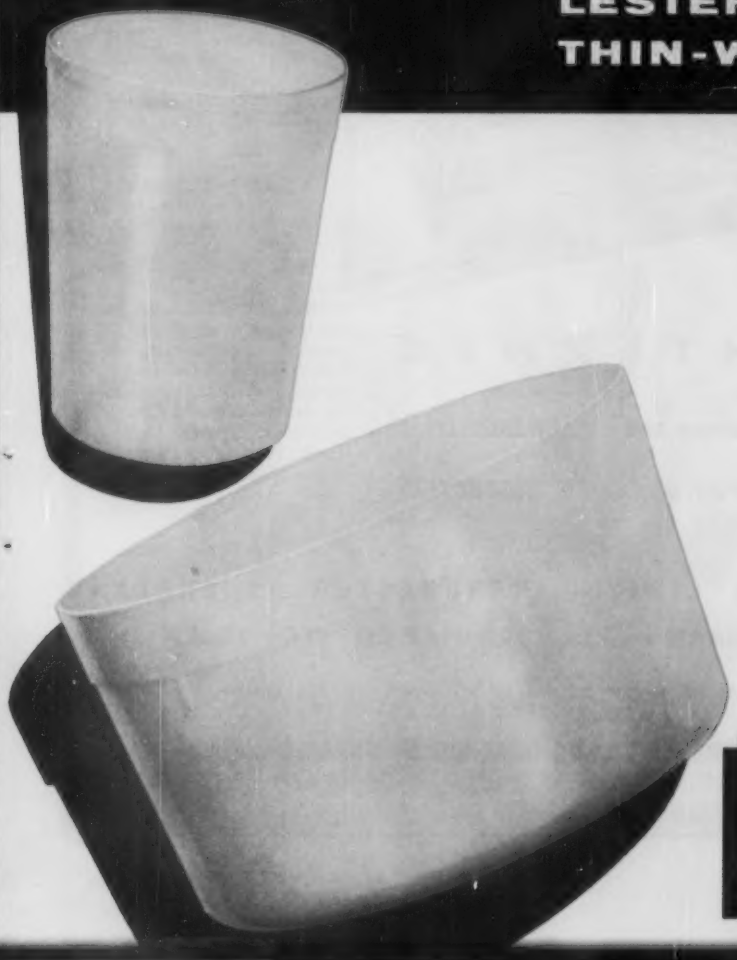
BOONTON MOLDING CO.

BOONTON, NEW JERSEY

New York Metropolitan Area—Cortlandt 7-0003 • Western New York Area—Alden 7134
Connecticut Area—Woodbine 1-2109 (Tuckahoe, N.Y.) • Philadelphia Area—Pioneer 3-0315



LESTER MACHINES and THIN-WALL CONTAINERS



If ever there was a perfect marriage of product and process, it is thin-wall containers and the 4 ounce Lester Injection Molding "Package-Maker". In less than a year, Mr. Jock Dunning and his company, Davenport Containers, Ltd., of Toronto, Canada have made themselves leaders in this field in Canada with this combination.

Based on the unfaltering high-speed, operatorless production of 4 ounce Lester-Automatic Molding Machines *Mr. Dunning has succeeded in reducing the cost of plastic containers to nearly that of paper* and, therefore, has opened a much wider market for such products.

This remarkable success story in automatic molding can be duplicated in your field, too... with Lester Machines.

LESTER-PHOENIX, INC.
2621-K CHURCH AVENUE • CLEVELAND 13, OHIO
Agents in principal cities throughout the world

SHAW INTERMIX

Compounding equipment for Rubber and Plastic Industries

QUALITY ENGINEERING FOR QUANTITY PRODUCTION

The SHAW Intermix is firmly established as a heavy duty internal mixer of outstanding quality and exceptionally low maintenance. Self-aligning rotor bearings overcome radial wear and the rapid dust-gland wear arising from axial shuttle. The exclusive rotor design produces mixing of a consistently high standard. The Intermix processes synthetic and natural rubber compounds, at lower temperatures than usual but can be steam heated for plastics and other materials. Francis Shaw & Co. Ltd. supply a unique range of plant for the Rubber and Plastic Industries. Enquiries are invited for Layout suggestions and arrangements.

FRANCIS SHAW & COMPANY LIMITED MANCHESTER 11 ENGLAND

TELEPHONE EAST 1415/8 TELEGRAMS CALENDER MANCHESTER TELEX 66-357

LONDON OFFICE: TERMINAL HOUSE GROSVENOR GARDENS PHONE SLOANE 0675-6 GRAMS VIBRATE LONDON TELEX 2-2250

FRANCIS SHAW (CANADA) LTD GRAHAMS LANE BURLINGTON ONTARIO CANADA

TELEPHONE NELSON 4-2350 TELEGRAMS CALENDER BURLINGTON ONTARIO

P4459

Watch Your Profits
Grow Bigger by using

Muehlstein

Reprocessed Plastics

When it comes to top quality and important material savings, look to the leader in reprocessed plastics. Muehlstein is constantly improving technical standards and laboratory efficiency to help lower your production costs. Whether it's Polystyrene, Polyethylene, Vinyl, or any other thermoplastic, you'll find your profits growing bigger when you do business with Muehlstein.

Extra! Ask about Muehlstein's new Polyethylenes: Modulene and Super Modulene.

H. MUEHLSTEIN & CO.
60 EAST 42nd STREET,
NEW YORK 17, N. Y.

AMERICA'S MOST PROGRESSIVE SUPPLIER OF REPROCESSED PLASTICS

REGIONAL OFFICES: Akron • Chicago • Boston • Los Angeles • Toronto • London
WAREHOUSES: Akron • Chicago • Boston • Los Angeles • Jersey City • Indianapolis

Thin wall clear polystyrene containers are formed in this mold of CRUCIBLE CSM 2. Mold Builder: Standard Tool Company, Leominster, Mass.

they picked ultrasonically inspected

CRUCIBLE CSM 2

from warehouse stocks

FOR HIGHER FINISH . . . LONGER MOLD LIFE – It takes a highly polished and dimensionally accurate mold to form clear styrene into these thin walled containers. And, because production-runs go into the millions, the mold steel has to be long lasting. Both are good reasons why CRUCIBLE CSM 2 was selected.

For CRUCIBLE CSM 2 is an exceptionally *clean* steel—uniform in composition and structure—with superior machining and polishing characteristics. And for absolute dependability, *every piece* of CSM 2 is ultrasonically inspected.

What's more, for your convenience, CSM 2 is immediately available from Crucible *warehouse stock* in 205 sizes. Next time you need mold steel—call Crucible. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

TECHNICAL BULLETIN | CLAREMONT RESEARCH DIVISION

date: APRIL 1, 1957
subject:

VALLEY—GRAVURE—LAMINABLE

THREE CLAREMONT INKS FOR PRINTING VINYLS

**All process and blotch colors—
rub resistant bronze golds, too.**

Claremont vinyl inks are distinguished by dependable, uniform working qualities. They give top quality results with conventional equipment and thinners. Stock formulations for valley, gravure and laminable printing. If your requirements are special, we can develop formulations to meet your needs. Ask for our Technical Bulletins Nos. 309 and 340. Data is ready also on our ink service for polyethylene printing.

PRINTS BY HARTFORD TEXTILE CORP.

CALIBRATED VINYL COLOR DISPERSIONS

For Calendering—Plastisol—Extrusion

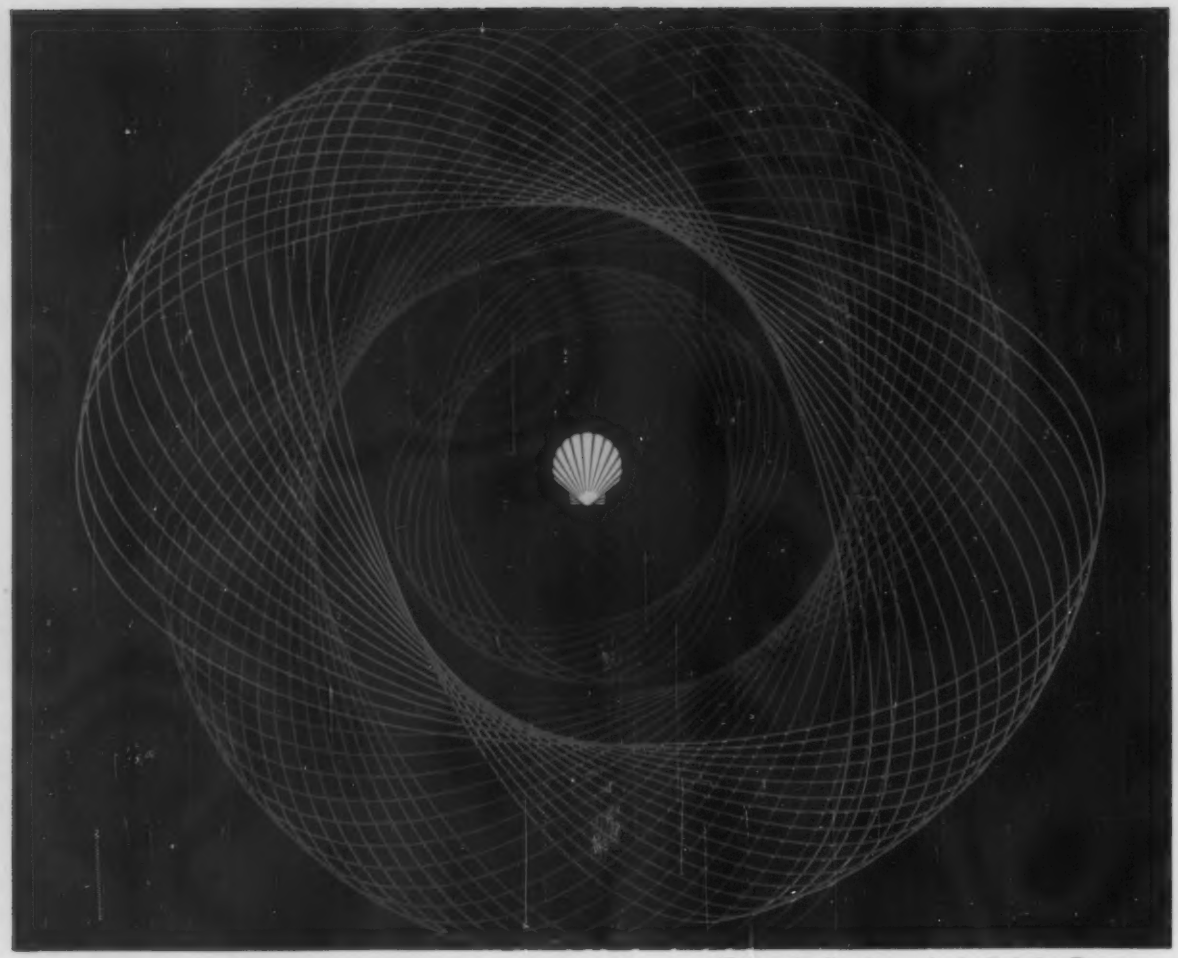
Claremont's system of color calibration, a proven production time saver, enables vinyl calenderers to run as many as eighteen different colors per day without down time. Color range of Claremont dispersions is spectrum wide, includes non-tarnishing metallics also. The data in our Technical Bulletins Nos. 175 and 140 are practical and valuable to vinyl fabricators. Ask for your free copy.

Remember that the formulation of plastic colorants and plastic printing materials—calibration and maintenance of color uniformity—are continuously applied sciences at Claremont.

Claremont is an information and service center on plastic coloring and printing problems.

Our engineering suggestion and advice are always yours for the asking.

CLAREMONT *pigment dispersion corp.* ■ *39 powerhouse road, roslyn heights, l. i.*



"Integration," an impression by C. Arthur Rosser

BUYING SOLVENTS?

Integrated deliveries reduce costs . . .

A GOOD WAY TO keep solvent costs down is to take full advantage of savings possible through *integrated deliveries*. When your total order equals a tank car quantity, you can buy individual solvents at bulk prices. Compartmented tank cars and tank trucks permit multi-product deliveries. Prompt delivery is assured from conveniently located storage facilities.

And when you make Shell Chemical your source for solvents, you can be sure that the products you receive will meet or exceed the highest purity standards set by industry.

Our technical service staff is prepared to work directly with you to help you make your own products better and less costly. Write for specifications and quotations on particular solvents.

- Acetone
- Methyl Ethyl Ketone
- Methyl Isobutyl Ketone
- Mesityl Oxide
- Ethyl Amyl Ketone
- Diacetone Alcohol
- Ethyl Alcohol
- Neosol® solvent
- Isopropyl Alcohol
- Methyl Isobutyl Carbinol
- Hexylene Glycol
- Secondary Butyl Alcohol
- Isopropyl Ether

SHELL CHEMICAL CORPORATION

CHEMICAL SALES DIVISION, 380 Madison Avenue, New York 17, New York

Atlanta • Boston • Chicago • Cleveland • Detroit • Houston • Los Angeles • Newark • New York • San Francisco • St. Louis

IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited • Montreal • Toronto • Vancouver

SHELL

The Plastiscope*

April 1957

News and interpretations of the news

By R. L. Van Boskirk

Section 1

Polyethylene pours out—prices peeled down. It would be an unusual month in the plastics industry when polyethylene didn't hog the spotlight. Last month was no exception. First, National Distillers Products Corp. announced it was changing its name to National Distillers and Chemical Corp. because chemicals now account for 34% of company profits. U. S. Industrial Chemicals Co. is the chemical division of National and sells nearly all National's chemicals. (See page 246 for further details.) U.S.I. claims that it will be the third largest producer of polyethylene by the end of 1957—that polyethylene is one of the company's top profit chemicals.

Furthermore, U.S.I. spokesmen state that its percentage of resin sales for film is higher than the national average—that it would be around 30% if exports are included in totals; 40% if exports are excluded. And U.S.I. also asserts that its paper coating resin is gaining a high reputation because of its good flow property. There is also talk of using this resin or a similar one as a fabric coating, but so far it is not in commercial production. Up to now, at least, the small amount of polyethylene-coated fabric offered has found no great market attraction.

U.S.I. management makes it clear that the company expects to get even bigger and more important in chemicals and plastics. Possibility of its producing vinyl chloride soon is often mentioned, but officials neither confirm nor deny the report. Guess is that management is divided over decision—up to now about 55% for it—45% not decided.

Price reduction to 35 cents. Just a few days before National Distillers' press announcement of name changing, its sales agent, U.S.I., reduced the price of standard molding- and extrusion-grade polyethylene from what was approximately 37 to 35 cents. Other companies soon followed. Thus, general-purpose or standard resin is now lower in cost than pipe-grade resin or compound. Neither compounded resins nor the higher-density resins were affected. Medium-density, high-pressure-processed resins are still around 39¢ and low-pressure-processed high-density resins are still 47 to 53 cents.

Polyethylene film now sells for about 48½¢ a lb. for 1½-mil film—it dropped from around 55¢ just a short time ago. The price schedules are complex because of various discount and quantity allowances; but even though the base price of film is 53.1¢, it is believed that 48½¢ represents a fair quotation for large-quantity lots. It is interesting to note that cellophane keeps rising in price and new capacity is still being added. Twenty thousand sq. in. of cellophane now cost about 62¢ against 48½¢ for 20,000 sq. in. of polyethylene—almost a third less for polyethylene. (*To page* 39)

*Reg. U.S. Pat. Off.

—Count on

COMMERCIAL

—always a dependable source!

We're "stacked-up" to serve you . . Fast!

Apace with each day's increasing demands, we warehouse "in depth" and for immediate delivery, the industry's largest and most complete range of plastic materials . . . All types—sizes—thicknesses. All colors —and all formulations quality-certified for uniformity!

Commercial's specification sheets with prices, covering your specific material requirements, may well serve as proof that what you want is what we have. Request your copies today!

COMMERCIAL PLASTICS AND SUPPLY CORP.

PHONE: GRamercy 7-5000

630 BROADWAY, NEW YORK 12, N.Y.

BRANCHES: 1039 Westside Dr., Greensboro, N. C.
3801 N.W. Second Ave., Miami, Fla.
119-9th St., Pittsburgh, Pa.

PRECISION FABRICATION DIVISION

Our Comco division is a complete custom service for the precision production of electronic, aircraft and industrial parts and assemblies fabricated from all grades of PHENOLIC LAMINATES, FISH PAPERS, FIBRE, NYLON, etc.

Comco welcomes the opportunity to bid your next fabrication requirement.

COMCO PLASTICS, INC.
97-24 Albert Road • Ozone Park 17, N. Y.
Phone: Michigan 1-0934

Write Dept. MP for "Sq. Ft. Converter" Chart for sheets up to 67" x 102"
—also New 1957 Catalog (64 pgs.) "Plastics for Industry"

The Plastiscope

(*Continued from p. 37*)

Polyolefins keep the guessers well employed. There is always room to speculate in the field of polyethylene, polypropylene, and other polyolefins. One old guess now confirmed is that Allied Chemical has a new low-pressure-processed polyethylene of its own—no tie-in with Phillips, Ziegler, Standard of Indiana, or anyone else. It will supposedly yield products having superior craze resistance, better surface finish, and even greater heat resistance than any of the other linear polyethylenes.

Hercules is moving along with polypropylene, as indicated in the annual statement which said: "Research efforts on polyolefin give promise of other interesting polymers for plastics such as polypropylene." The Hercules effort also is believed to be entirely independent, without any attachment to European or other American patent holders or licensors. Resin may be available in development quantities by the end of 1957. Meanwhile, Hercules lets it be known that 10 or 12 customers are using its low-pressure-processed polyethylene for actual production items. The company will have sold at least 1 million lb. of commercial grade by June 1, most of it for experimental items although some molders use it in standard items without mentioning it to customers. This amounts to a sort of secret testing method to find out how the material will be received.

Standard of Indiana and Phillips indicated at the Notre Dame polymer conference last summer that polypropylene could and would be made by their processes but have made no comment since. Speculation is also around concerning the possibility of using the present low-pressure polyethylene plants for production of polypropylene. Some technicians say only slight modification would be necessary. The same ease of conversion is also said to apply to monomer production.

Polypropylene film from two unidentified sources is being shown in various places. It is exceptionally clear and has a reported density of from 0.890 to 0.905 compared with 0.950 to 0.960 for linear polyethylene. But don't bet on obtaining any sizable quantity of polypropylene before mid-1958.

Polymer Chemicals Div. of W. R. Grace & Co. opened its plastics laboratory at Clifton, N. J., last month. The company's new 50,000-lb. capacity plant near Baton Rouge, La., is scheduled to start producing linear polyethylene in fairly large volume some time late this year. In the meantime, about 1000 lb. a day is being produced for experimental work. The Clifton laboratory will be devoted to customer problems.

Laminated wall covering. The Velvetex Div. of Velveray Corp. is marketing a new vinyl chloride-to-fabric laminate for wall covering. Heretofore, most vinyl wall coverings have been coated fabric or paper. The wall-covering film or sheeting is in thicknesses of from 4 mils up. The heavier material is sometimes used on the lower portion of a wall with the thin sections on the upper portion. The film used is Monsanto's Ultron, plasticized to prevent shrinkage and consequent separation at the seams. The paste for hanging the new Velvetex covering is especially compounded for Velveray with a 30% solids base so that it can be used on any surface. Velveray should know about adhesives—the firm is perhaps the largest in the flocking business, and one of the tricks in flocking is to make the flock stick. Velvetex has had a two years' successful trial in several well known hotels and insti-

From colorful and durable panels for delivery trucks to handsome television cabinets...

Pittsburgh Selectron POLYESTER RESINS

Now Ready For A Thousand New Uses!

COUNTLESS products benefit from the combination of beauty and durability Pittsburgh SELECTRON Polyester Resins can give—and usually at reduced manufacturing costs.

SELECTRON Resins are used in products ranging from truck panels that withstand extreme hot and cold, rain, snow, and sleet to television cabinets that serve as focal points of beauty in homes everywhere.

SELECTRON Resins are thermo-setting polyesters which are available in consistency from a thin syrup to extremely high viscosity. They polymerize to form solids, with or without heat and with or without pressure.

When combined with such fillers as fiber glass, cotton, rayon, nylon, felt, sisal, paper, etc., SELECTRON Resins provide a new kind of material that is lighter than aluminum, yet—weight for weight—is stronger than steel. This material has great impact resistance and withstands the deteriorating influence of weather, sunlight, heat, abrasion and many chemicals. It can be molded in durable colors.

Parts in which SELECTRON Resins are used can be molded either by hand lay-up, direct molding, continuous lamination or pre-forming. These resins can also be used without fillers for casting, potting and impregnating.

Investigate the advantages of SELECTRON Resins that may make your products better looking, stronger and more durable. We'll be glad to have one of our engineers discuss your problems with you without cost or obligation. Such a visit may point the way to important production economies and added sales appeal.

SEND FOR FREE BOOKLET

● Write, wire or phone today for our new booklet containing description of SELECTRON Polyester Resins and explaining many of the ways in which they can be used. Pittsburgh Plate Glass Company, SELECTRON Products Division. Gateway Center, Pittsburgh, Pa.

Just a few products in which Pittsburgh SELECTRON Resins are now used—

Aircraft structural parts
Radomes for electronic equipment
Life floats
Ballistic panels
Helmets
Boat hulls
Machinery housing and guards
Trays
Tote boxes
Food lockers
Garbage pails
Baskets for automatic dishwashers
Baskets for automatic washers
Wash tubs
Tool chests
Shipping containers
Instrument cases
Laundry hampers
Kitchen containers
Fishing rods
Sinks
Street signs
Traffic signs
Fluorescent light fixtures
Television cabinets
Loudspeaker housings
Gas meter housings
Structural panels for offices and homes
Door and transom lights
Awnings and canopies
Greenhouse panels
Skylighting
Molded chairs
Prefabricated houses and garages
Truck bodies

PITTSBURGH Selectron PPG

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

The Plastiscope

(*Continued from p. 39*)

tutions, but the company is now aiming to capture a sizable share of the home as well as the institutional market.

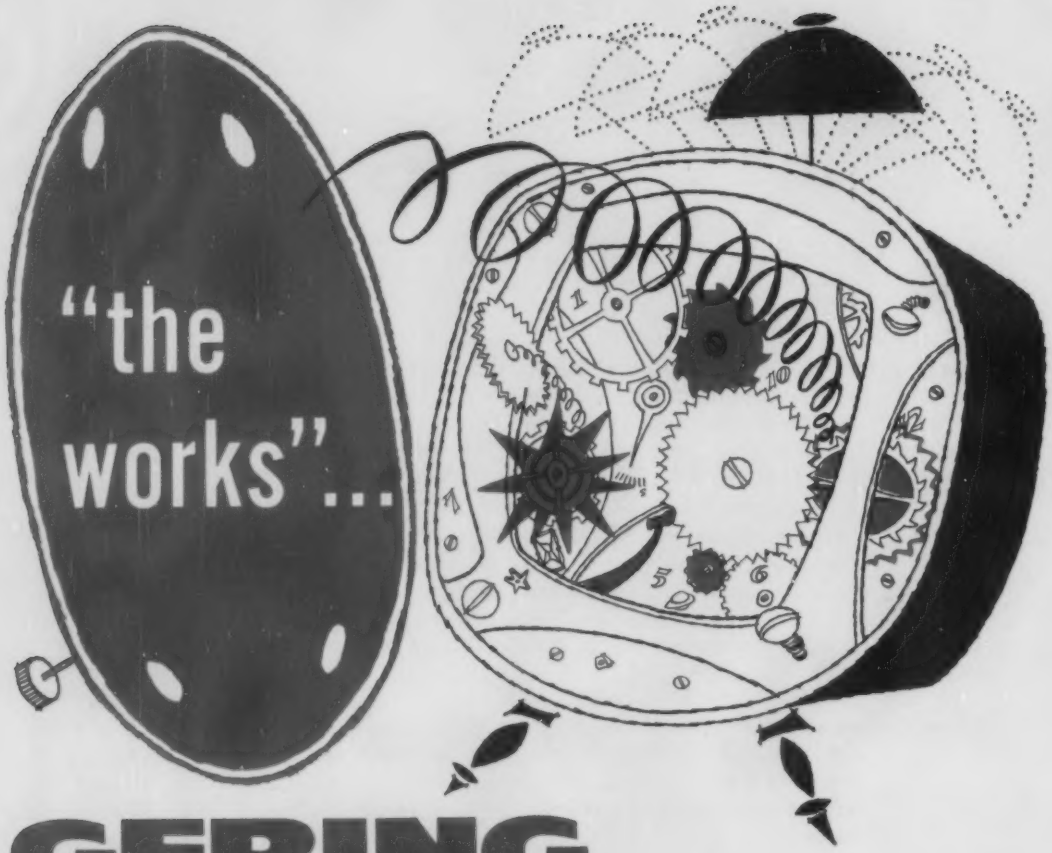
Not quite 4 billion. The sum of all the synthetic resins and cellulosics produced in 1956, including paint resins, was 3,910,000,000 lb., according to a sum-up of the Tariff Commission's monthly figures as printed on p. 196. A final revised figure will be printed in June or July when the Commission's annual report is issued. The 3.9 billion figure is almost identical to the MODERN PLASTICS' estimate printed in the January issue. The S.P.I. estimate printed at that time and widely circulated in other media gave a figure of over 4.1 billion pounds. Consumption of resins in 1956 was between 3.6 and 3.7 billion pounds. Surface coating and coumarone or petroleum resins accounted for well over 1 billion lb. of the total; the balance of the synthetic resins included in the statistical report went into various adhesives.

The sweet and the bitter. Without the increase of almost 160 million lb. of polyethylene over 1955 production, the synthetic resins and cellulosics figure for 1956 would have been considerably under the 3.85 billion-lb. total for 1955. Production of polyethylene grew from 400 million in 1955 to 558 million in 1956. Sales increased from 350 million lb. to 510 million. The earlier MODERN PLASTICS' estimate was 508 million. Polyethylene exports were close to 150 million pounds. Vinyl chloride consumption of domestic resin (including exports of 40 million lb.) was 570 million lb. compared with 520 million in 1955. Some 25 to 30 million lb. of imported vinyl chloride resin was processed in the United States, mostly by calenderers. Polyethylene and vinyl chloride were the only large-volume plastics to show a substantial growth.

Polystyrene molding powder held its own because of a big first half year; it slumped severely in the second half. Consumption was 391 million compared with 386 in 1955. The earlier MODERN PLASTICS' estimate was 390 million pounds. However, this figure does not include an estimated 10 to 20 million lb. by one producer who doesn't report to the Government. Phenolic molding powder sales were 190.5 million lb. compared with 200 in 1955. Urea and melamine molding material, plus a small amount of miscellaneous, was 85 million lb. in 1956, 86 million in 1955, which must mean that urea slumped since melamine increased considerably because of its use in tableware. Molded and extruded cellulose acetate and butyrate was 92 million lb. compared with 90 million in 1955.

New thermoset with color. For two years the Durez Div. of Hooker Electrochemical Co. has been supplying sample quantities of a new polyester molding powder to a few customers who have been using it for sewing machine parts, foot pedal assemblies, knobs, bobbins, handles, and other items. They have now announced that the new molding material will be commercially available this fall from a new $570,000 facility at North Tonawanda, N. Y.

Big advantage of the new thermoset material is that it can be furnished in color, even in light shades, whereas phenolic is always dark. The material is a brand new family of polyesters not to be confused with the



GERING

Specialists in Plastic Scrap Reclamation

At Gering, scrap reclamation is an important job in which we take great pride. We actually create valuable molding material from space-wasting scrap often considered useless by many manufacturers. Gering provides the modern equipment and the skilled personnel required to set up the highest standards in sorting, separating, grinding, decontaminating, blending, color matching, compounding and pelletizing. This is why Gering assures you the highest quality in uniform reprocessed thermoplastic molding materials.

WE BUY thermoplastic scrap, all types and forms, including rejects and obsolete molding powders.

Polystyrene — Cellulose Acetate
Vinyl — Ethyl Cellulose — Polyethylene
Butyrate — Acrylic — Nylon

WE REJUVENATE by using the most modern equipment and methods known in the entire industry. Gering pioneered in conversion of thermoplastic scrap — and nobody knows how to do this job better than Gering!

WE SELL expertly reconditioned molding powders that do a fine, dependable job to help lower your costs.

Plastic scrap is not waste ... when reclaimed by GERING!

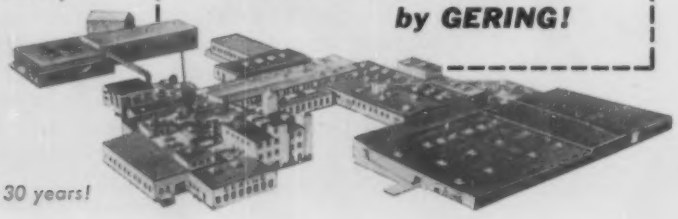
Service • Quality • Dependability

GERING

PRODUCTS, INC.

KENILWORTH, N. J.

Pioneers in modern plastics for over 30 years!



The Plastiscope

(*Continued from p. 41*)

polyesters used for reinforced plastics, polyurethanes, or Dacron. The filler is less expensive and more conventional than the glass fibers used in reinforced compounds. It has excellent dimensional stability and heat resistance, is similar in physical properties and improved in electrical properties over general-purpose phenolics, has good shelf life, and can be handled in existing phenolic dies and molding equipment.

The Durez product is sold in fine granular form as a dry powder rather than in large solid chunks or as pasty semi-solids, as is the case with other polyesters. The price range is from 42 to 77¢ a lb., depending upon the quantity ordered by the purchaser.

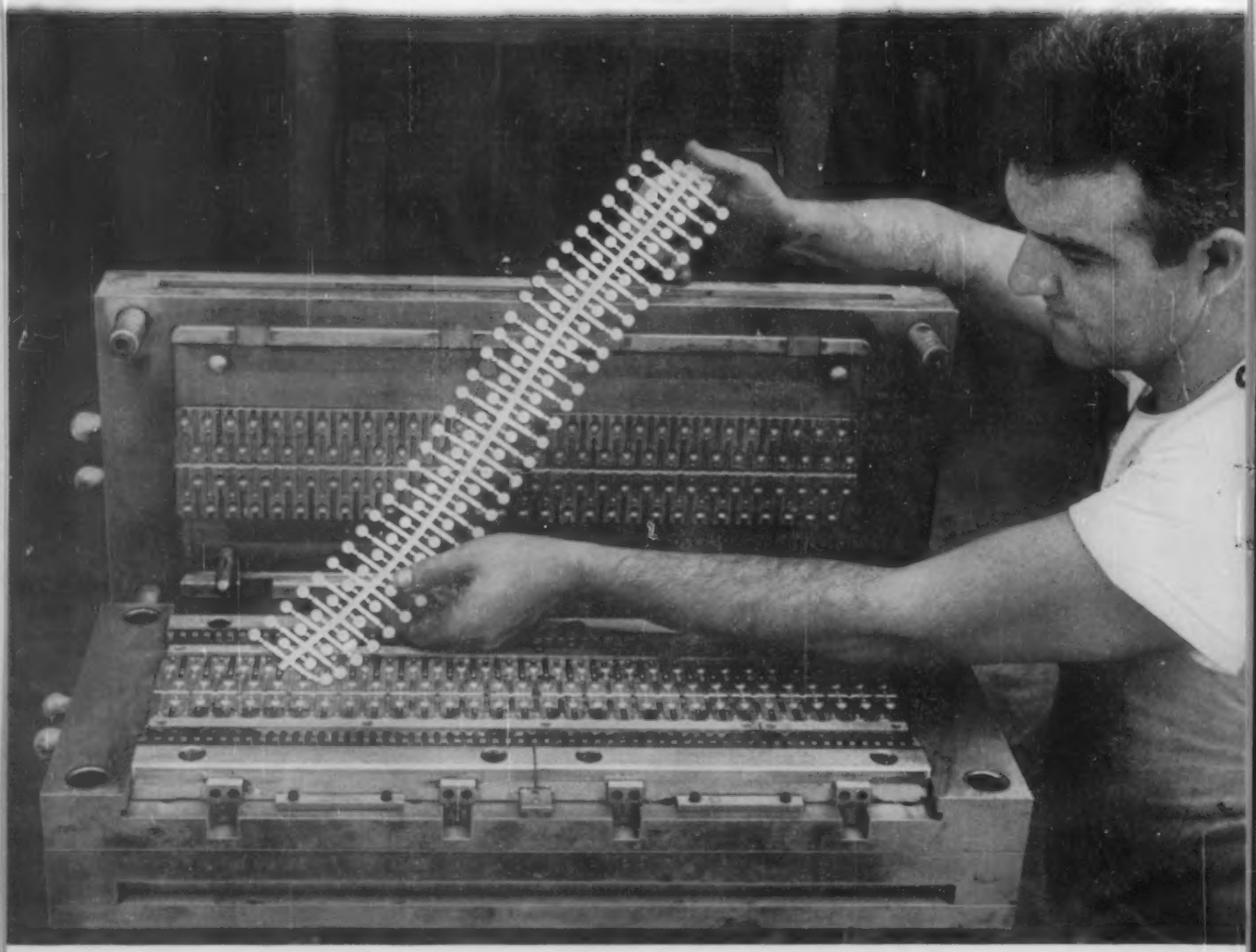
Youngsters who spend dough. The market for soft, hollow play balls of from 2 to 6 in. in diameter is a nice business. Kids use them and lose them in great quantity—two or three can be dug out from most any man's hedge at clean-up time in the fall; cats and dogs like them too. The sale of such balls made from rubber in 1947 amounted to $10 million; in 1954 it was only $5 million. But what a nice answer there is for that in plastics; the sale of plastic balls —mostly plastisol—in 1954 is estimated to have been $6 or $7 million; in 1947 vinyl sales for that application were practically zero.

Suede vinyl chloride. Availability of Tolex suede vinyl for shoe uppers has been announced by the Textileather Div. of General Tire. It is said to not only duplicate the genuine material, but to be more resistant to scuffing; also, it can be washed and the color will not rub off. It comes in 54-in. widths and eliminates the need of cutting around hide defects.

Another particle board plant. American Cyanamid is constructing a $1 million plant at Farmville, N. C., to manufacture Formica Flakeboard which is now being produced on the West Coast. Particle board sales have grown from 5 million sq. ft. in 1947 to 55 million in 1955. Volume by 1960 is expected to top 400 million in non-structural applications alone, such as furniture and underlay for decorative laminates. It is claimed to have advantages over plywood and solid lumber. Sheet sizes of the Farmville plant will run up to 6 by 12 ft., in thicknesses from ¼ to 1¼ inches.

A different type of reinforced plastic. Haveg Industries, Inc., Wilmington, Del., has developed a modified furan resin, Haveg 6610, to use with fibrous glass reinforcement. It is claimed to provide complete corrosion resistance to an even wider range of conditions than polyester resins and to be just as light in weight. It is reported that the material will not support combustion and that it will give continuous service at 300° F. Haveg 6610 is black, but the company is working on a clear resin. Price is 60¢ per sq. ft. for 2-oz. glass mat reinforced material, or about 15% below top-grade polyester and 10% above standard polyester. It is suggested for tanks, fume ducts, hoods, etc.

For additional and more detailed news see Section 2, starting on p. 246



INJECTION MOLD OF DURAMOLD B

Produces Plastic Poppit Beads

This 120-cavity injection mold, of Bethlehem Duramold B tool steel, is used in an 8-oz injection machine to produce one size of the popular polyethylene Poppit Beads. The mold was made by R. A. Koegl Stamp & Die Works, Hillside, N. J., from steel supplied by Ackerlind Steel Co., Inc., New York.

The mold has a surface hardness of about Rockwell C-62. It has provided excellent service because of the high core strength of Duramold B, plus its resistance to wear.

Duramold B is an oil-hardening grade of chromium-type plastic-molding die steel, with an addition of boron. It is resistant to distortion. Moreover, it can be annealed to a hardness of 100 max Brinell. This permits easy cold-hobbing, even where deep or large cavities are used.

TYPICAL ANALYSIS

Carbon 0.07	Manganese 0.30
Silicon 0.15	Chromium 1.00
Molybdenum 0.25	Boron added

If you would like to have full information about Duramold B, or any of the other Bethlehem tool steel grades for plastic-molding applications, just get in touch with your Bethlehem tool steel distributor. He'll assist you in every possible way.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM TOOL STEELS

BETHLEHEM STEEL

For maximum **UNIFORMITY** *and* **LIGHT STABILITY**

For consumer sales appeal or for industrial identification . . . for novelty effects or for practical applications . . . REZ-N-DYE is the world's finest and fastest external coloring agent for plastics.

Whether you use the cold-dip, hot-dip, brush, swab or spray method—Schwartz Chemical research laboratories have created an efficient REZ-N-DYE for each purpose. And, if your particular operation calls for a special application, chances are Schwartz can create a process to achieve your objective.

Transparent colors ranging the full length of the visible spectrum, are custom-matched for your individual requirements and for fashion promotions. For metallizing—Copper, 14K Gold, Antique and Brass are available to fill your particular specifications. Tortoise shell and other interesting effects are readily achieved with versatile REZ-N-DYE.

For colorful quality products, always specify REZ-N-DYE . . . often copied but never equalled.

If you have a plastic problem, contact our research laboratories. There's no obligation. Solving plastic problems is an integral part of our service.

Serving the needs of the plastic industry

schwartz

CHEMICAL CO., INC.

328 West 70th St.

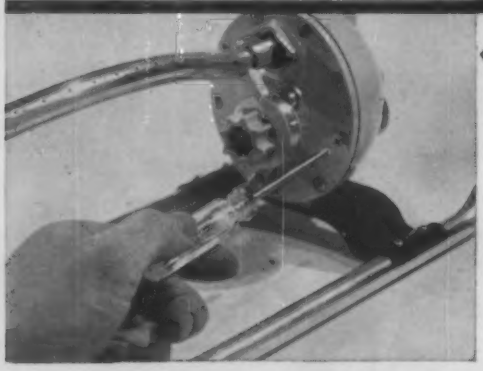
New York, N. Y.

MANUFACTURERS OF DYES—LACQUERS—CLEANERS—ADHESIVES—EXCLUSIVELY FOR PLASTICS

Investigate the assembly savings made possible by P-K® self-tapping screws

Because P-K Type A Self-tapping Screws have clean, deep slots and sharp gimlet points . . . and because they are consistently uniform, Reznor Mfg. Co. enjoys important savings in the assembly of their gas heaters.

To hold the plastic handle halves of their Instant Heat Soldering Irons together, The Lenk Mfg. Co. specifies P-K Type F Self-tapping Screws. No need for a separate tapping operation. Production is increased and costs reduced—thanks to P-K Screws.



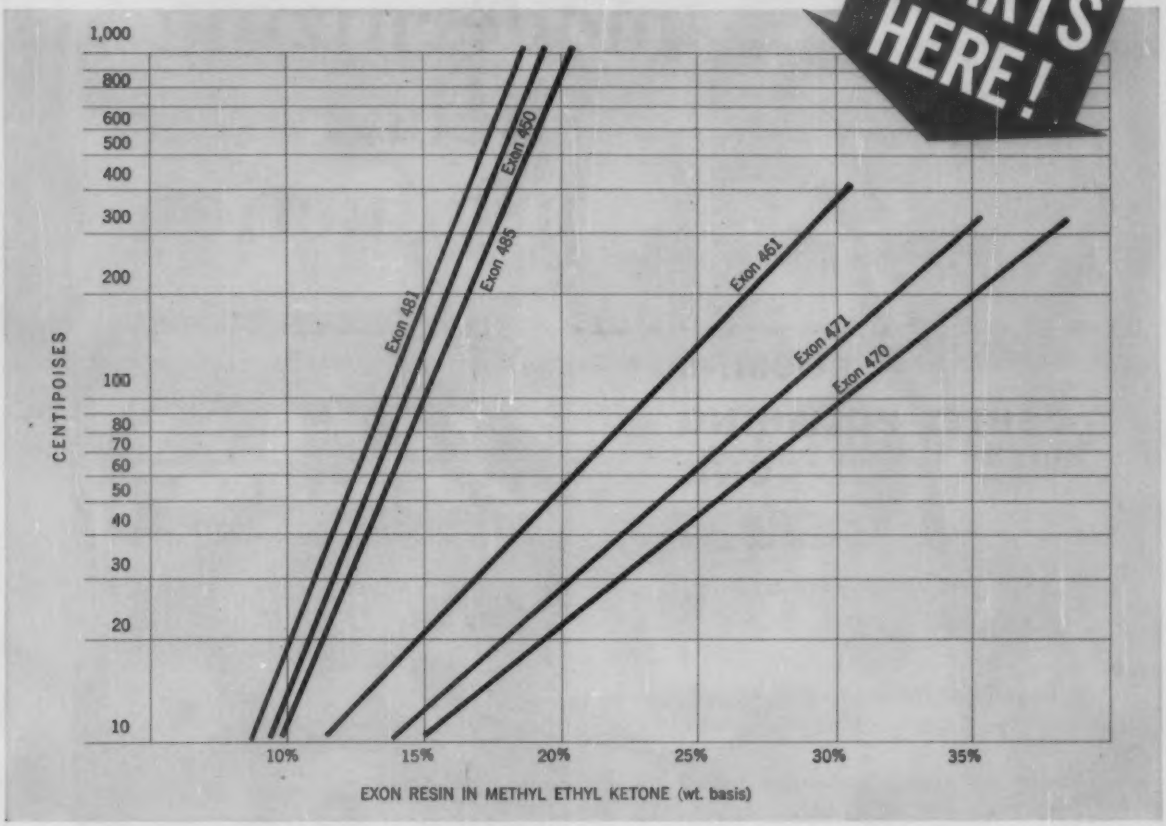
Melnor Industries, Inc. (formerly Melnor Metal Products Co.) puts assembly strength into their famous "Swingin' Spray" oscillating lawn sprinkler by fastening zinc and aluminum parts with P-K Self-tapping Screws—7 Phillips Head Type Z and 18 Type F. They start right . . . drive right . . . and stay tight.

PARKER-KALON DIVISION, General American Transportation Corporation
Manufacturers of Self-tapping Screws, Socket Screws, Screwnails, Masonry Nails, Wing Nuts and Thumb Screws

PARKER-KALON® fasteners

Sold Everywhere Through Leading Industrial Distributors
Factory: Clifton, New Jersey—Warehouses: Chicago, Illinois—Los Angeles, California

SUCCESS IN COATINGS STARTS HERE!



EXON CHARTS SOLUBILITIES to help you choose the resin with properties Pin-Pointed to your special needs!

EXON 450 Ideal for strip coatings. Good solubility, tensile strength and durability.

EXON 461 A unique fluorine-containing resin combining high solubility, unusual chemical resistance, heat stability and weatherability.

EXON 470 Excellent adhesion to metals, alkyd and vinyl surfaces. Compatible with wide range of drying oils, alkyds, phenolics, melamines. High solubility in inexpensive solvents.

EXON 471 Excellent for weatherability and durability in a protective coating. Corrosion resistant. No measurable change after sunlamp exposure for 360 hours as 1 mil film.

EXON 481 Makes possible colorful, abrasion-proof, washable coatings that resist fading or cracking.

EXON 485 For superior strip coatings. Lower viscosity makes application easier and shelf-life better. Good clarity.

Firestone EXON RESINS

THE special nature of Exon resins — "Pin-Pointed Properties" to supply specific answers to special needs — is particularly desirable in the manufacture of coatings.

Because products and processes vary, Firestone Exon has engineered 6 solution resins to help you formulate a successful coating. Each resin differs in properties, such as the solubility factor charted above, to suit various applications.

One property in common: superior quality of performance with the resultant production speed and savings which have made Firestone Exon industry's No. 1 source of specifically engineered vinyl resins.

We suggest you keep this chart handy—to help you put your finger on the right resin for *you* — at a glance.

For complete information and technical service, call or write:

CHEMICAL SALES DIVISION

FIRESTONE PLASTICS COMPANY, DEPT. 72F,
POTTSTOWN, PA.
A DIVISION OF THE FIRESTONE TIRE & RUBBER CO.

INDUSTRY'S MOST COMPLETE LINE OF VINYLS ENGINEERED TO YOUR SPECIFIC NEEDS

modernizing sheet production

eliminate lamination by using

ROBBINS SHEET POLISHING UNIT

and do this for your production:

1

By polishing rather than laminating you get full output from your extruder.

2

You get a uniform polish without wrinkle and pit-holes.

3

By not having to purchase lamination material you cut cost of end product.

Robbins Sheet Polishing Unit is self-contained with all component parts and controls included in the price of the machine. *Write for further information.*

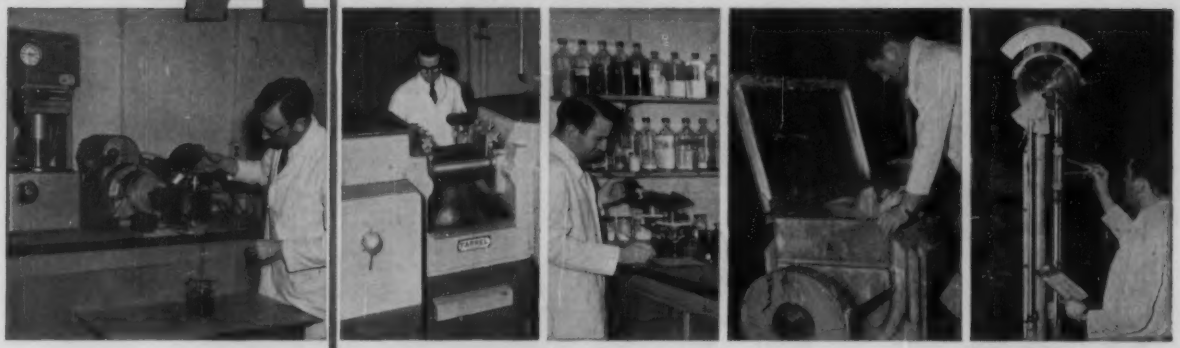
Robbins
never say die . . . say Robbins die

PLASTIC MACHINERY CORP.

1430 MISHAWAKA STREET

ELKHART, INDIANA

A. Schulman, Inc. answers today's biggest plastic question . . .



Why are so many molding and extruding plants buying

LABORATORY CONTROLLED

processed vinyl and polyethylene?

Because they're saving money. Our processed vinyl and polyethylene DO cost less, but at the same time, precise laboratory control assures a product of the highest quality. Working with modern methods and machines, we are able to fill your raw material orders to EXACT specifications, at definite savings to you. HOW?

We maintain complete laboratory equipment of the very latest type, and a staff of highly skilled technicians checks the quality of vinyl and polyethylene we buy, then keeps a constant watch on our processing. Whether you do molding or extruding, we are in a position to handle your requirements . . . just let us know what product you make and give us your specifications.

There is NO GUESSWORK involved — and it COSTS YOU LESS.

Samples mailed on request.

If you make products like these you can depend on A. Schulman, Inc. laboratory controlled polyethylene and vinyl. **A TRIAL ORDER WILL CONVINCE YOU!**

A. Schulman Inc.

AKRON, OHIO
790 E. Tallmadge
HEmlock 4-4124

BOSTON, MASS.
738 Statler Bldg.
Liberty 2-2717

LOS ANGELES, CALIF.
1127 Wilshire Blvd.
MAdison 9-1493

NEW YORK CITY
460 Park Ave.
MUrray Hill 8-4774

E. ST. LOUIS, ILL.
14th & Converse
BRidge 1-5326

BUFFALO, N.Y.
33 Berkley Place
ELmwood 1751

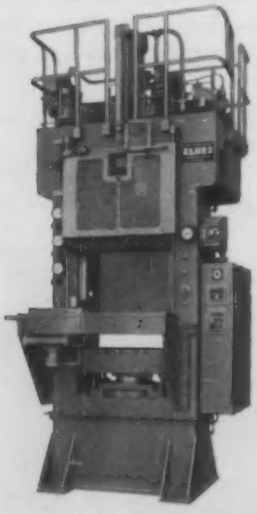
A. SCHULMAN, INC., LTD.
Ibex House, Minories
LONDON E.C. 3, ENGLAND
Telephone: Royal 4989

A. SCHULMAN (U.S.A.) GmbH
Bodekerstrasse No. 22
HANOVER, GERMANY
Telephone: 2-6212

NIXON New Formula Rigid Vinyl Sheet

No pressing problem TOO TOUGH for an Elmes

"Job-Fitted" HYDRAULIC PRESS



Elmes 200 x 50 ton Transfer Molding Press. This unit was specially designed to meet customer's requirements. Equipped with movable guard gates at front and back for protection of the operator. Extended table with roller knockout at left end permits use of two bottom molds—a great timesaver when working with small or delicate inserts.

"Missionary work" needn't get you in a stew. When development planning presents really tough problems in pressure application—*that's* the time to call Elmes "to the rescue," for consultation and recommendations. More than 60 years of specialized hydraulic press experience makes Elmes preeminently equipped to provide *the right press for the job.*

It may be that a standard-design Elmes® Press—for compression or transfer molding operations, hot-plate laminating, or reinforced plastics molding—will meet all your requirements. Or a simple adaptation may be indicated. Or unusual production requirements may call for development of a special "custom-built" press—a large and important part of Elmes service to industry.

In any event, whatever your particular needs, Elmes experience and ingenuity are your best bet for turning pressing problems into profit-making performance. Distributors in principal industrial centers.

Elmes American Steel Foundries
ENGINEERING DIVISION

1159 Tennessee Avenue, Cincinnati 29, Ohio

METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

NIXON New Formula Rigid Vinyl Sheet advances the *beauty* and *efficiency* of

an unusual display case

Rich brown alligator grain is meticulously reproduced.

Recesses hold jewelry cards in place. Each set is sold in individual gift box snugly displayed in lid.

Beige calf grain interior. Note depth of draw in lid. Sandwich construction makes lightweight case sturdy.

One good-looking container fulfills the complete selling cycle! Jewelry is **shipped** and **displayed** in it, **sold** from it and **gift-boxed.**

The basic material chosen was Nixon's, because, as most leading manufacturers know, Nixon for years has had a knack with rigid vinyl sheet, also an accommodating way of coming up with new formulations at just the right time.

To meet new heat forming techniques, new concepts of design that combine utility with distinction, to meet every requirement of this particular application, these sheet characteristics had to be present:

- extra dimensional stability
- extra high impact and heat resistance
- excellent surface properties

Let Nixon help **you** to lower cost production by starting you off with the right material. Come in, write or phone.

Brown and beige .025-gauge sheets based on B.F. Goodrich Co. Geon high impact vinyl resin. Pressure formed and constructed by ***Plaxall Inc.****, Long Island City, N.Y., for Speidel Corporation, Providence, R.I. Styled by Richard Arbib Co., N.Y.C.*

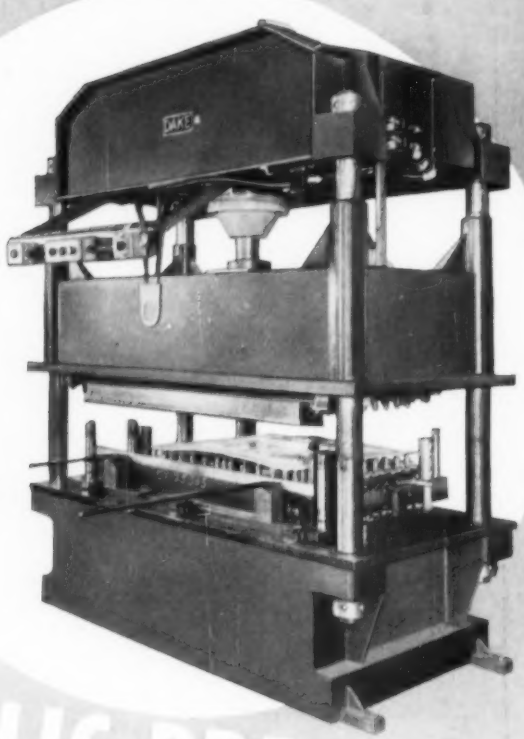
Your source for every kind of fine formable sheeting

nixon PLASTICS

NIXON NITRATION WORKS • FOUNDED 1898 • NIXON, NEW JERSEY

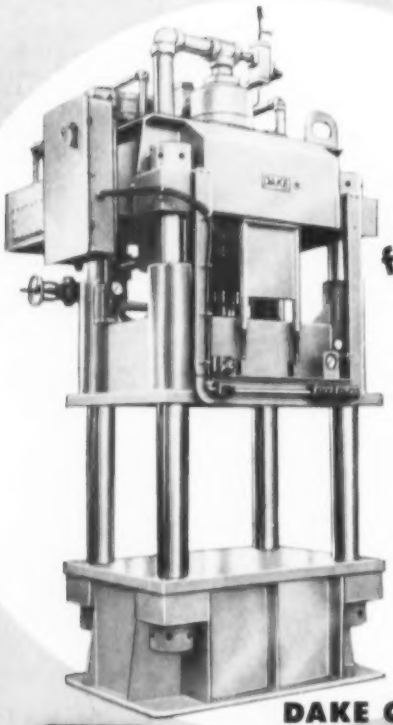
Phone — New Brunswick, Charter 9-1121, Metuchen Liberty 9-0200, New York Extension WOrth 4-5290. **Chicago Office,** 510 North Dearborn Street, Phone Michigan 2-2363. **St. Louis, Mo.,** C. B. Judd, 3687 Market Street, Phone JEfferson 5-8082. **Leominster, Mass.,** A. F. Perry, C. A. Dovidio, Phone 7-2120. Canadian Distributor: Crystal Glass & Plastics Ltd., 130 Queens Quay East, Toronto, Ontario.

available in standard and custom engineered models



for trimming and piercing vacuum-formed plastics

DAKE HYDRAULIC PRESSES



for molding reinforced plastics

Be a pacemaker in the fast-moving plastics industry with equipment designed to keep production geared to modern trends. Dake Hydraulic Presses speed output and reduce costs. They are job-engineered by men experienced in the plastics industry. These men are ready to help you meet special requirements as well as provide better equipment . . . both for compression molding of reinforced plastics as well as trimming and piercing vacuum-formed plastics. Standard models are electric-hydraulic in operation, with capacities ranging from 25 to 300 tons. They are adjustable for stroke, pressure, temperature and timing. Dual palm-operated controls are standard, providing safety in operation. Dake will gladly work with you in developing whatever special press equipment you need.

For descriptive literature on these presses, write for Bulletins 340 and 352.

DAKE CORPORATION 648 Seventh St., Grand Haven, Michigan

DAKE PRESSES

Arbor Presses

Hand-Operated Hydraulic

Power-Operated Hydraulic

Guided Platen

Gap Type Presses

Movable Frame

ON STREAM FOR YOU

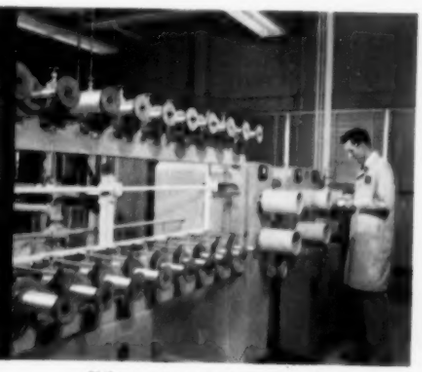
MARLEX
50
POLYETHYLE
PHILLIPS CHEMICAL COMPANY
PHILLIPS CHEMIC
BARTLESVILLE,
NET W
ON STREAM FOR YOU

IMAGINATION HEADQUARTERS

New uses . . . new processing methods for MARLEX 50 polyethylene are developed and tested in this Sales Service Laboratory at Phillips Research Center, Bartlesville, Oklahoma. Standard production machines are backed by a full range of evaluation and research laboratories. Here, skilled scientists, engineers and technicians are working for you. Their broad background in up-to-the-minute plastics technology is fully available to you through your MARLEX sales representative at his office listed below.

s are welcomed to our Service Laboratory

Fully equipped evaluation laboratory



Filaments are drawn under factory conditions

perating conditions studied here

Take up your special problems with our technical staff

We look forward to working with you.

PLASTICS SALES DIVISION PHILLIPS CHEMICAL COMPANY

A SUBSIDIARY OF PHILLIPS PETROLEUM COMPANY BARTLESVILLE OKLAHOMA

DISTRICT OFFICES

NEW ENGLAND	322 Waterman Avenue, East Providence 14, R.I. GEneva 4-7600
NEW YORK	80 Broadway, Suite 2535, New York 5, N.Y. DIgby 4-3480
AKRON	318 Water Street, Akron 8, Ohio. FRanklin 6-4126
CHICAGO	111 S. York Street, Elmhurst, Ill. TErrace 4-6660
WESTERN	330 Security Bldg., Pasadena, Calif. RYan 1-6997
SOUTHERN & FOREIGN	Adams Building, Bartlesville, Oklahoma. Bartlesville 6600

MAR
50
POLYETHY
Phillips
66
PHILLIPS CHEMICAL COMPANY
BARTLESVILLE, OKLAHOMA
NET WT. 50 LB.
NEW PRODUCT OPPORTUNITIES NEW PROCESS
INJECTION MOLDING
FILM

One by one, three thousand pumps take on their intricate assignments.

In the giant reactors, ethylene stirs and responds to a unique catalytic influence.

At Adams Terminal on the Houston Ship Channel, Phillips Chemical Company is now on stream with full scale manufacture of

MARLEX 50

POLYETHYLENE

Right now the world's strongest, toughest ethylene polymer is available commercially.

Right now you can get up to 40% more production per pound of resin by taking full advantage of the inherent strength of MARLEX 50. You may get up to 25% faster cycle time, too, because MARLEX 50 sets up at higher temperatures. ***And talk about service!*** MARLEX 50 withstands heat, cold and abrasion . . . it resists oil, solvents and chemicals with an unparalleled efficiency that suggests scores of new and profitable uses you could never touch before.

Right now call your MARLEX sales representative. Find out how MARLEX 50 polyethylene is ready to make money for you in moldings, film, filaments, vacuum forming and many other applications.

MARLEX is a trademark for Phillips family of olefin polymers.

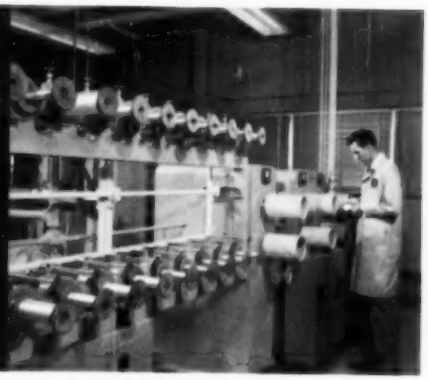
S ECONOMIES WITH MARLEX 50 POLYETHYLENE

IMAGINATION HEADQUARTERS

New uses . . . new processing methods for MARLEX 50 polyethylene are developed and tested in this Sales Service Laboratory at Phillips Research Center, Bartlesville, Oklahoma. Standard production machines are backed by a full range of evaluation and research laboratories. Here, skilled scientists, engineers and technicians are working for you. Their broad background in up-to-the-minute plastics technology is fully available to you through your MARLEX sales representative at his office listed below.

Visitors are welcomed to our Sales Service Laboratory

Fully equipped evaluation laboratory



Filaments are drawn under factory conditions

Actual operating conditions are studied here

Take up your special problems with our technical staff

We look forward to working with you.

PLASTICS SALES DIVISION PHILLIPS CHEMICAL COMPANY

A SUBSIDIARY OF PHILLIPS PETROLEUM COMPANY, BARTLESVILLE, OKLAHOMA

DISTRICT OFFICES

NEW ENGLAND	322 Waterman Avenue, East Providence 14, R.I. GEneva 4-7600
NEW YORK	80 Broadway, Suite 2535, New York 5, N.Y. DIgby 4-3480
AKRON	318 Water Street, Akron 8, Ohio. FRanklin 6-4126
CHICAGO	111 S. York Street, Elmhurst, Ill. TErrace 4-6600
WESTERN	330 Security Bldg., Pasadena, Calif. RYan 1-6997
SOUTHERN & FOREIGN	Adams Building, Bartlesville, Oklahoma. Bartlesville 6600

Specify an IC Complete Package of Companion Components for

PREMIX COMPOUNDING

THESE ARE THE IC COMPANION COMPONENTS FOR PREMIX COMPOUNDING

IC-625 Polyester—High strength, rigid, resistant to water and most chemicals.

IC-671 Polyester—High strength, resistant to water and most chemicals, low volatility, excellent moldability.

IC-1014 Resilient Polyester—High flex strength, fast curing, low volatility, permits high filler loading.

IC-638 DAP Polyester H.V.—Good electrical properties, resistant to water and most chemicals, fast cure, high strength, good stability, non-volatile.

IC-947 Resilient DAP Polyester H.V.—High flex strength, fast cure, good filler wetting, non-volatile.

IC Color Concentrates—For IC Polyesters.

IC Activators and Promotors—For adjusting cure cycles.

Imagine being able to formulate a premix compound with just exactly the right physical characteristics for each job! *You* decide what hardness, flexibility or impact resistance you need and build it right into your own formula. *You* pick the type of resin characteristics you want and maintain them day after day or change them at will.

When you come up with a good premix compound for a specific job, it's exclusively *yours*. It gives you a competitive position in quality and cost. It gives you the production versatility to mold one product today and another with entirely different requirements tomorrow. It keeps your resin inventory at a minimum.

All this is yours to enjoy when you use the specially formulated team of IC* Polyester Companion Components for premix compounding.

Write on your company letterhead for the new IC booklet on PREMIX COMPOUNDING or call your nearest IC Polyester Resin Specialist for further details.

Interchemical
CORPORATION
Finishes Division

Commercial Resins Department
1754 Dana Avenue, Cincinnati 7, Ohio
224 McWhorter Street, Newark 5, New Jersey

Factories: Chicago, Ill. • Cincinnati, Ohio • Elizabeth, N.J. • Los Angeles, Cal. • Newark, N.J. • Mexico City, Mex. In Canada, IC Polyester Resins are sold by Chemical Oil & Resin Company, Toronto, Ontario, under its trademarks. **IC is a registered trademark of Interchemical Corp.*

Diamond calcium carbonate fillers do more than save money

Sure, you can shave your costs* by filling glass-reinforced polyester resins with precipitated calcium carbonates. But just as important—in a quality-demanding market—is the fact that DIAMOND fillers help turn out products with these improved properties:

Smooth surfaces

Surfaces of *filled* reinforced polyesters are definitely better than those that aren't filled. Glass fibers are hidden. Deep cracks in resin rich areas are eliminated.

Controlled viscosity

Unfilled resin tends to flow from between closed match dies. You waste resin. Filled resin, because of its higher viscosity, stays within the mold's confines. Using the proper DIAMOND filler, you can control the viscosity and give the resin a body most suitable for the operations involved.

Decreased shrinkage

Fillers greatly reduce the shrinkage occurring during polymerization.

Greater wet strength

After immersion in water for seven days, filled polyesters show less loss in physical properties than unfilled ones do.

More even cooling rate

Polyester resin cools five to six times faster than glass fibers. This makes the fiber pull away from the resin, particularly at the surface. You get a surface that's difficult to paint. A precipitated calcium carbonate helps the resin mix and the glass fibers cool at a more even rate. The surface is smoother, easier to paint.

These improved properties reduce rejects and eliminate "touching up."

What fillers? DIAMOND suggests these four:

Surfex® MM—Particle size: 1 to 5 microns. Resin coated. Oil absorption 20-22 cc per 100 grams. Maintains low viscosity for a given filler concentration. Wetted very easily by resin.

Kalite®—Particle size: about 1 micron. Oil absorption 28-32 cc per 100 grams. Recommended for draw work.

Suspenso®—Particle size: 1 to 5 microns. White. Uncoated. Oil absorption 20-22 cc per 100 grams. Use in applications where pot life is critical. Eliminates crazing in resin rich areas.

Multifex® MM—Particle size: .05-.06 micron. Uncoated. Gives reinforced plastic a smooth white, nonporous finish. Requires less extra work after molding. Little buffing required.

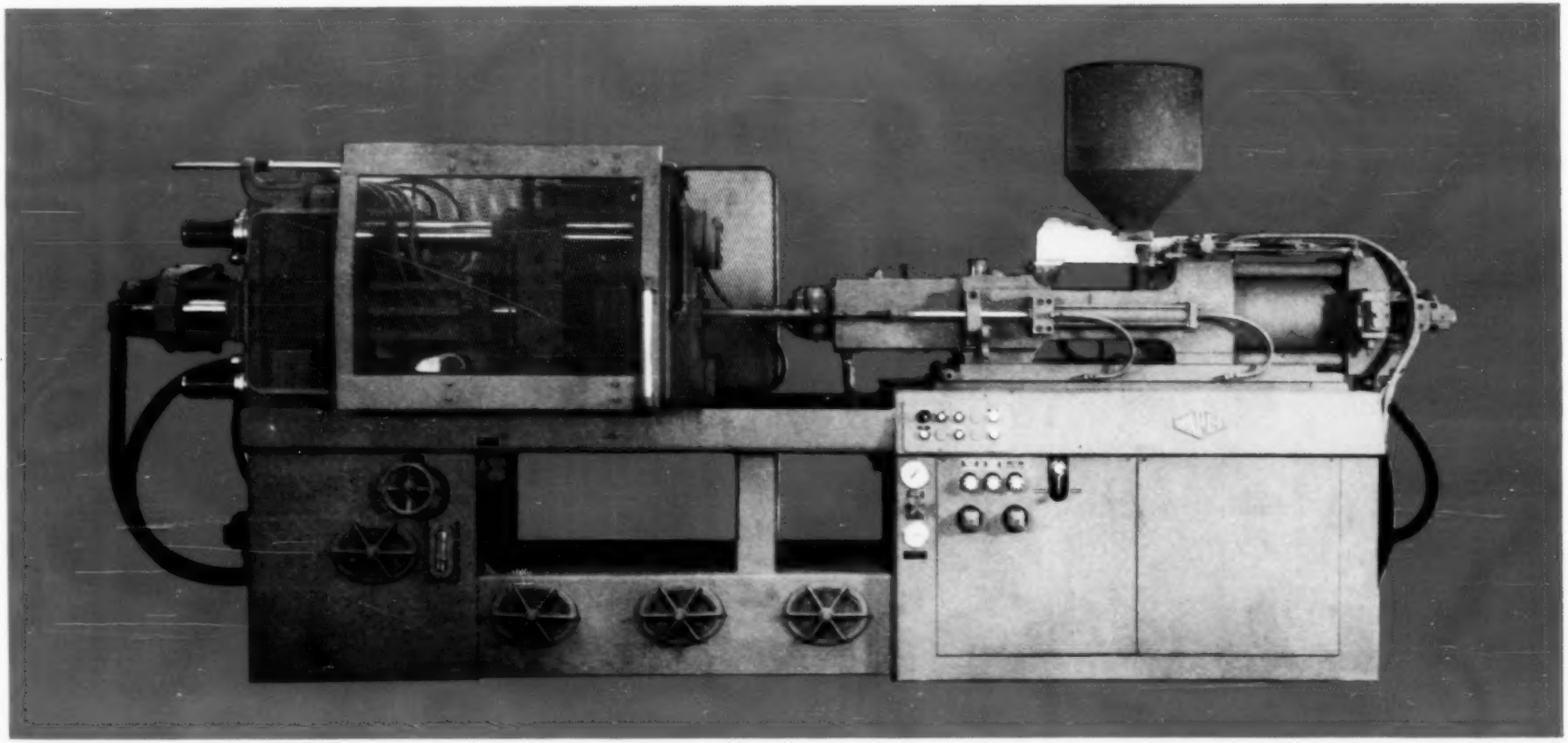
*Your nearby DIAMOND sales representative can show you money-saving formulas and detailed cost comparisons. Or ask for Bulletin No. 8. Write DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

Sales Offices: New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Houston.

Diamond Distributors: Carmona & Hawxhurst, San Francisco; Dorsett & Jackson, Los Angeles; Van Waters and Rogers, Inc., Seattle and Portland, U.S.A.; Harrisons & Crosfield (Canada), Ltd.

DIAMOND CHEMICALS

Diamond Chemicals



750 Dry Cycles Per Hour
at Full 14 1/4" Stroke
with this 8-10 ounce machine—
the New Impco HA8-275

For complete specifications on this new model, send today for Bulletin P-114

IMPCO

IMPROVED MACHINERY INC.

NASHUA, NEW HAMPSHIRE

Export Distributers: Omni Products Corp.
460 Fourth Avenue, New York, New York

one company source for

FABRICS - FINISHES - IMPREGNATIONS

impregnated fabrics

Quality glass fabrics woven, finished, impregnated under our exclusive one-company operation. Consistently uniform products for general purpose and high temperature-high strength uses. Standard and custom systems in phenolic, silicone, epoxy resins. Available chopped for matched die molding.

finishes and impregnations

World's most up-to-date facilities for impregnation of natural and synthetic fabrics, felts, paper and asbestos. Plant accommodates widths up to 72". Standard and custom finishes and impregnations. Research and development facilities available to work with your engineers on new materials.

boat fabrics

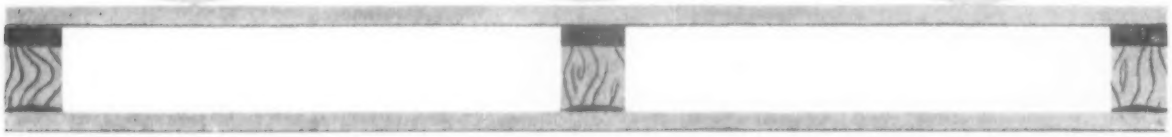
Fiberglass fabrics for glass boat makers and for refinishing wooden boats with permanent, maintenance-free hull or deck surface. Special Volan AC finish assures complete wetting out, makes a more perfect bond of cloth to wood. Available in special weights and weaves for various marine applications.

industrial fabrics

Standard glass fabrics at low cost to meet your volume requirements. Custom materials developed to meet individual needs. Wide range of weights, widths, weaves. Available plain, finished or impregnated. Ideal for laminates, production parts, structurals, other wet layup operations.

tooling fabrics

Detail, General and Build-Up fabrics at low cost for tooling applications. All are Volan AC finished for easy layup even on complex forms and for excellent wetting out characteristics. A complete range of standard and custom fabrics mass-produced for low cost.

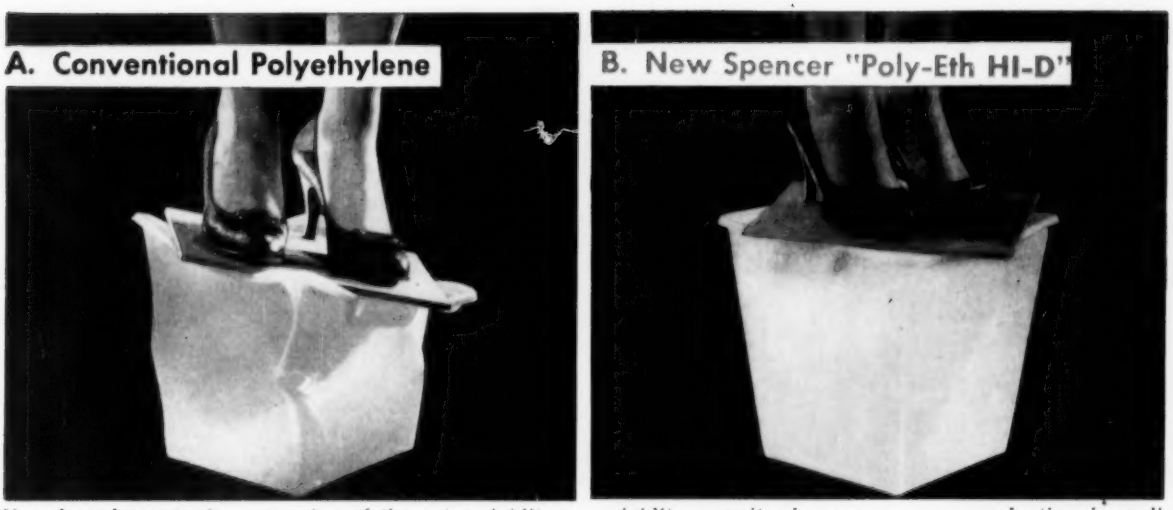


Call or write for data on Trevarno products and services

Trevarno
GLASS FABRICS

COAST MANUFACTURING & SUPPLY COMPANY

P. O. BOX 71, LIVERMORE, CALIFORNIA • Plants at Livermore and Seguin, Texas



Here is a dramatic demonstration of the extra rigidity in Spencer Chemical Company's important new polyethylene discovery, "Poly-Eth Hi-D." This improved rigidity permits, in many cases, a reduction in wall thickness without loss in strength. Molders report savings of up to 5c a pound on material costs.

Material Costs Cut 5c a Pound by Using NEW, STURDIER Polyethylene

Remarkable new Hi-Density "Poly-Eth" by Spencer offers you production savings, superior products, new profit opportunities

It often actually costs less to mold polyethylene products with Spencer Chemical Company's new discovery, Hi-Density "Poly-Eth"! That's because "Poly-Eth Hi-D," with a density ranging from .935 to .940, is so much more rigid than ordinary polyethylene that it takes only 69% as much material for a given rigidity. With the reduced quantities of polyethylene necessary, you can often make savings of up to 5c a pound on material costs.

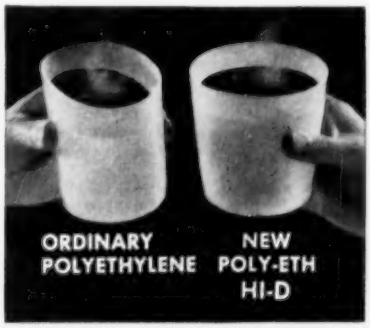
As a boilable, see-through film, "Poly-Eth" has striking advantages, too. Unlike other boilable plastics, it can be heat-sealed. And—because it offers protection at less cost—it greatly increases opportunities for packaging food in boilable see-through packages. This sturdy low-cost film is also excellent for many other uses — such as packing acids, volatile chemicals or metal parts.

Many other profitable new products are possible with super-rugged "Poly-Eth Hi-D." The products can have the advantages of conventional polyethylene PLUS the advantages shown in these pictures. Those advantages include improved tensile strength and rigidity, and increased heat resistance.

Only Spencer offers you commercial quantities of this new polyethylene. So, for more information, contact your nearest Spencer sales representative, or write to Spencer Chemical Company for a "Poly-Eth Hi-D" data sheet.

SEE "POLY-ETH" IN ACTION
National Packaging Exposition
Chicago, Ill. . . . April 8-11
BOOTH NO. 895

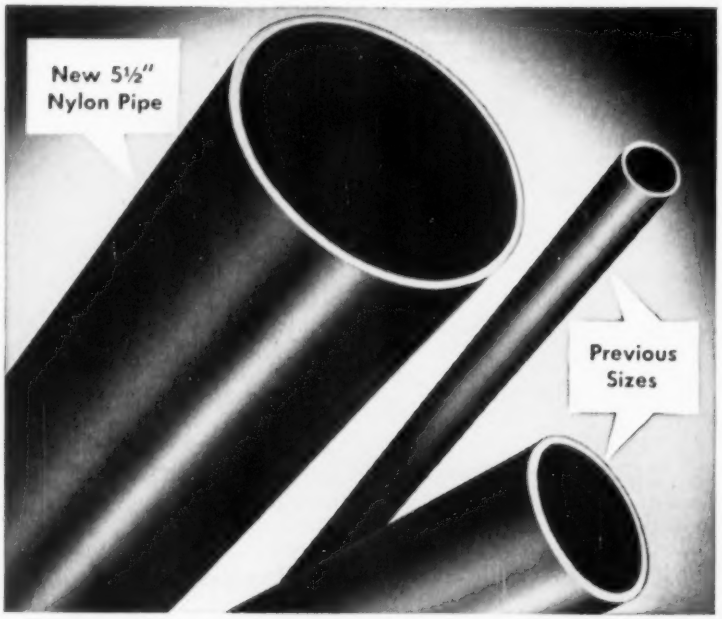
Cooking in "Poly-Eth Hi-D" bags has been tested with many foods in Spencer laboratories. What product would *you* like to package in a film that will withstand 240° F?



Stiffer than ordinary polyethylene, "Poly-Eth Hi-D" doesn't wilt when filled with hot liquid, and it has clarity and high gloss of high pressure polyethylene.

SPENCER CHEMICAL COMPANY
Dwight Bldg., Kansas City 5, Mo.

BIGGER NYLON PIPE



Now with new Spencer Nylon you can make up to 5½" pipe that is:

- Impervious to powerful chemicals, as well as oil, fats, and grease
- Not damaged even by live steam
- Not harmed by liquids under pressure
- Durable as metal in many applications
- Lighter than metal and many other plastics

Here's a new way to make money! A new nylon pipe, that dwarfs all earlier nylon pipes, offers you a whole new world of profit opportunities! And you can now make giant nylon pipe with new Spencer Nylon!

Nylon has always been an ideal pipe material. Unlike other plastics, nylon withstands high pressure and even live steam. It has superior chemical resistance and is also impervious to hydro-carbons like fats and oil.

But with old-type nylon it has been practical to make only small-diameter tubing. At extrusion temperature *ordinary* nylon runs like water, and extruding large objects with it is out of the question.

New Spencer Nylon solves the problem! Because it has an unusually wide processing range for nylon, it's easier and safer to handle, and less likely to degrade during processing. And because it has a greater plasticizing range, it sets up more slowly, which, to a high degree, prevents voids. As a result, it is now possible to make dependable nylon pipe with diameters up to 5½".

Big nylon pipe is already in use. On ships, for instance, its ability to withstand high pressure makes it perfect for high pressure deck lines. Because of its chemical inertness, it serves excellently for salt water wash down lines and sewer pipes.

Petroleum is another industry where big nylon pipe shows great promise. Because nylon is impervious to oil, it can be used as casing when electromagnetic instruments are lowered far under the earth's surface to study the potentialities of oil or gas formations. This system is already in use in the Near East. Unlike steel, it won't mask logging instruments. And unlike other plastics, nylon withstands the intense temperatures found in the depths to which the instruments are lowered.

Wherever there is need for pipe that withstands heat, pressure and abrasion, that resists powerful chemicals as well as hydro-carbons, yet has plastic light weight and high strength —chances are mighty good there is another spot where nylon pipe has a profitable future.

And the best nylon for pipe is new Spencer Nylon! New Spencer Nylon has the highest-controlled specifications of any nylon on the market today! That's because it is manufactured by continuous polymerization instead of by the old-fashioned "batch" process.

A multi-million pound plant, now under construction in Henderson, Ky., will soon be ready to supply you with Spencer Nylon. To meet existing demands, Spencer now offers AKU-manufactured shipments of this same superior nylon in eight grades.

If you'd like to share nylon's profitable future, contact Spencer's Research and Development Department. Spencer Chemical Company is already leading the plastics industry with the first commercially-available high density polyethylene, and a new premium pipe grade polyethylene.

Now the same outstanding staff of experts who produced these advances are ready to give careful consideration to your problems or questions, and to offer you suggestions for new markets. Just write to Spencer Nylon, Spencer Chemical Company, Dwight Bldg., Kansas City 5, Mo.

NOW! NYLON *by* SPENCER

SPENCER

SPENCER CHEMICAL COMPANY

GENERAL OFFICES: DWIGHT BUILDING, KANSAS CITY 5, MISSOURI

Looking for a New Way or a New Kind of Machine?

● **There are several ways to reduce processing costs** . . . combine some of your operations; eliminate the dollars frozen by material-in-process inventory; develop as much of a continuous operation as possible; or cut down on rejects and scrap.

These are big assignments. We know, because we make our living doing just that for manufacturers and processors of rubber and plastic.

We specialize only on rubber and plastic operations . . . no others. Naturally, all of our personnel are rubber and plastic specialists. We understand yields; how much it should cost to make a product; and what kind of equipment you need.

We build special machinery for special jobs. We continually design and build machines which have never been designed or built before. If you want a plan for improving your manufacturing costs, write us. Doing things differently for a profit — yours and ours — is our business.

Improving Costs of Manufacturing is Our Business

Sales and Engineering by

HALE and KULLGREN, INC.

P. O. Box 1231 · AKRON, OHIO

MANUFACTURED BY

THE AETNA-STANDARD ENGINEERING CO., PITTSBURGH, PA.

PLANTS IN WARREN, OHIO · ELLWOOD CITY, PA.

HYDRITE KAOLINITE FILLERS

improve reinforced plastics 6 ways

1. Maximize smoothness and gloss
2. Reduce exotherm and shrinkage
3. Minimize water absorption
4. Improve physical, electrical, and chemical properties
5. Aid machinability and fabrication
6. Reduce plastics material costs

The use of HYDRITE KAOLINITES provides distinct advantages in surface structure, exotherm, and cost, without loss of the laminate's physical strength. And the controlled particle sizes of HYDRITE KAOLINITES help to raise flexural and impact strength of the compound.

For loading polyesters, a 40% Hydrite Kaolinite and a 45% styrene formulation shows a general upgrading and improved surfaces. Phenolics also benefit greatly from the use of HYDRITE KAOLINITES as fillers because of their lack of pH sensitivity and their low water absorption. Alcohol dilution and the oven-drying impregnation system used with phenolics allow higher filler loadings of at least 50% kaolinite.

HYDRITE KAOLINITES when used in diallyl phthalate give superior molding and surface qualities, and as in phenolics, allow high filler loading. Kaolinite, because of its stability, may also be used safely at all ratios in epoxies with no danger of violent chemical reaction. In addition, epoxy laminates show a general upgrading of all properties when kaolinite is used as a filler material.

These and other facts relating to the advantages of the use of HYDRITE KAOLINITES in reinforced plastics are described in detail in our new Bulletin 4.

Send for your free copy today.

GEORGIA KAOLIN COMPANY

433 North Broad Street, Elizabeth, N. J.

New "Dutch Boy" Stabilizer team... new quality for automotive grades of vinyl film and sheeting

Here's the latest from "Dutch Boy" research . . . two new "Dutch Boy" Stabilizers especially suitable for automotive vinyls, including "clears".

Flomax* 25 . . . a new and different barium-cadmium organic complex . . . remarkable for clarity, for economy. Flomax 25 gives you outstanding heat and light stabilization combined with freedom from yellowing and plate-out.

Nalzin* is an effective new zinc organic co-stabilizer that prevents sulfur staining.

In calendered stocks, these "Dutch Boy" non-lead Stabilizers team up to assure quality that reaches or exceeds automotive standards. What's more, they do so with outstanding economy.

Both, for example, are easy to incorporate and disperse. They're liquid . . . miscible in and compatible with common plasticizers and solvents.

Both are ideal, too, for cost and efficiency . . . suitable for high-quality, low-cost formulations.

Where unusually high heat stability is a requirement . . . or sheeting is unusually heavy . . . other "Dutch Boy" barium-cadmium Stabilizers, Provinite*, and Clarite* are widely used. Both provide an extra measure of heat stability.

If you produce automotive or furniture upholsteries, luggage or heavy-duty film stocks, you may want to know more about these and other "Dutch Boy" Stabilizers for vinyls. A new "Dutch Boy" Stabilizer Handbook gives full details, including formulae. Write for a copy.

National Lead also provides technical assistance in the use of these "Dutch Boy" Stabilizers.

Dutch Boy® CHEMICALS

*Trademark

NATIONAL LEAD COMPANY
111 Broadway, New York 6, N. Y.

In Canada: CANADIAN TITANIUM PIGMENTS LIMITED
630 Dorchester Street, West, Montreal

KOPPERS PRO

helping you

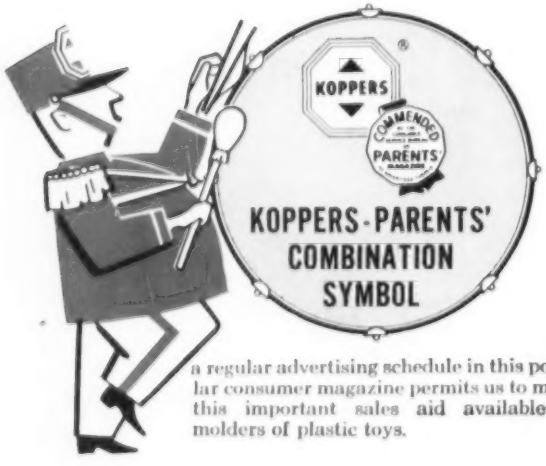
a merchandising label available to all molders using DYLITE expandable polystyrene. Featuring the *Good Housekeeping or Parents' Seal*, the label assures consumers of a quality product.

a newly introduced consumer label available for products made of SUPER DYLAN polyethylene. It identifies the product as being made of this new, tough, boilable plastic.

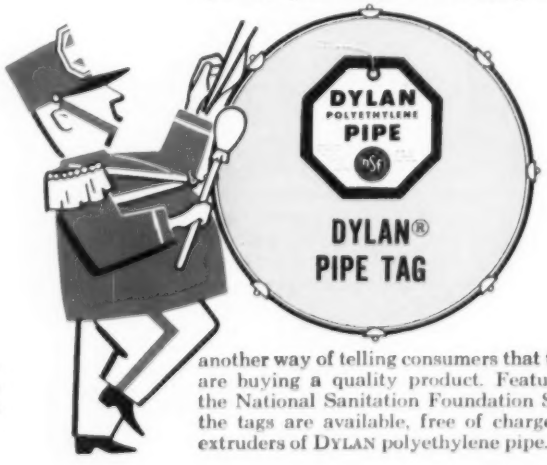
*Koppers Trademark

our advertising in this long-respected publication enables us to make the valuable buying influence of this seal available for your product.

this handy booklet, published biennially, lists names and addresses of plastic package molders with full information on sizes available. Mailed to over twelve thousand packaging buyers, the directory channels potential business directly to you.



a regular advertising schedule in this popular consumer magazine permits us to make this important sales aid available to molders of plastic toys.



another way of telling consumers that they are buying a quality product. Featuring the National Sanitation Foundation Seal, the tags are available, free of charge, to extruders of DYLAN polyethylene pipe.

MOTION PARADE

sell your products

CONSISTENT, WELL-ROUNDED PROMOTION and advertising by Koppers has one primary objective: to gain recognition and firmly establish acceptance of the plastic products you make. The sales aids shown below are just a few of the programs designed to help you. Together with regularly scheduled advertisements, exhibits and direct mailings aimed at engineers, designers, purchasing agents and, of course, consumers, they result in more sales for you, your distributors and your retailers.

initiated three years ago, this annual competition was established to award substantial recognition to molders of outstanding plastic housewares. It is a strong effort by Koppers to increase consumer acceptance of quality plastic products.

a continuing campaign in one of the most widely read consumer publications to keep the public aware that products made with Koppers material are of the highest quality.

offered by Koppers to *all* molders of plastic wall tile. Koppers–molders–distributors–retailers participate in this annual multi-city newspaper promotion to increase consumer sales of plastic wall tile.

THESE SALES-BUILDING TOOLS can be put to work for you, too. To find out how *you* can participate in Koppers Promotion Parade, see your Koppers representative or write to Koppers Company, Inc., Chemical Division, Department MP-47, Pittsburgh 19, Pennsylvania.

KOPPERS

KOPPERS PLASTICS

Moppet chooses TITANOX* for hiding power . . .

. . . and you will prefer these white pigments—whether your plastic or rubber products are in sheet or other form.

Even with very low pigment content, you can attain remarkable effects in whites and pastels with one or more of these leading white pigments such as TITANOX-RA. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Atlanta 5; Boston 6; Chicago 3; Cleveland 15; Houston 2; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 14, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1; Vancouver 2.

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

4790

*TITANOX is a registered trademark for the full line of titanium pigments offered by Titanium Pigment Corporation.

how to put your finger on

20% *higher production*

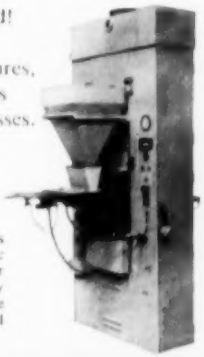
Consistency
The auto-control molding cycle ensures a product of uniform excellence, because once the sequence is pre-set it never varies.

Economy
Semi-skilled labor and female labor can be used advantageously. One operator can often work more than one press at a time, according to the nature of the job.

Productivity
Unvarying, pre-set sequences ensure that the maximum number of lifts at correct cure is obtainable. The reject rate is always drastically reduced, especially on complicated jobs.

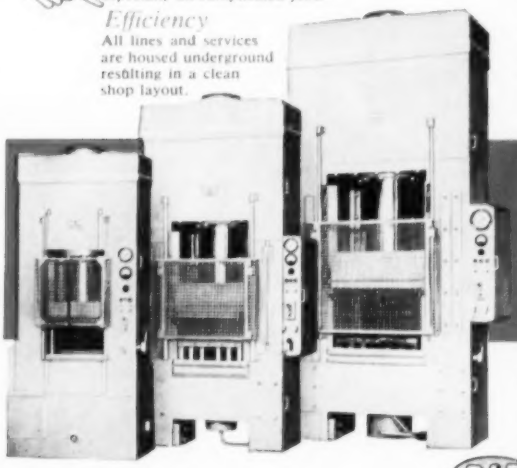
Efficiency
All lines and services are housed underground resulting in a clean shop layout.

"Install BIPEL presses and *up* goes the production rate" say BIPEL'S many users. Increases average 20% and even higher results are often obtained. The answer is simple: BIPEL'S Auto-Control replaces hit-and-miss human judgment, assures a precise, uniform sequence at the touch of the button! You get more cycles per hour, and rejects are virtually eliminated! BIPEL Compression-Transfer Presses are available in 3 standard models, each offering a selection of 3 pressures, ranging from 23 to 336 tons, and modified standard models to 450 tons. Contact us regarding special requirement presses.



Now Available Fully Automatic!

The new Automatic Loading Table . . . for any BIPEL Press up to 170 tons capacity . . . offers *completely* automatic operation! It requires no more floor space than the operator it replaces . . . and the unit may be converted back quickly to semi-automatic molding, if required! Send for complete illustrated data on BIPEL Presses *and* BIPEL Horizontal Hydraulic Performers.



"BIPEL" is a Registered Trade Mark
World Patents Granted or Pending

...this is BIPEL

American Inquiries to:

RALPH B. SYMONS ASSOCIATES, INC., 3571 Main Road, Tiverton, R. I.

CANADIAN INQUIRIES TO: JOHN SPERLING, 739 Mountain Street, Montreal

B.I.P. ENGINEERING, LTD. Streetly Works, Sutton Coldfield, England

Get jetness at low cost with the "ALL-PLASTIC" BLACK

Columbian's

COWAXBLAK-CB

30% DISPERSION OF SUPERBA® (carbon black)

in Resinous Chlorinated Paraffin

- Versatile—Cowaxblaks are compatible with all the important plastic systems.
- Faster compounding with no grinding since black is predispersed.
- Greater uniformity... every batch is uniformly and perfectly dispersed.
- Cleanliness... dustless dispersion keeps plant clean-up and contamination to a minimum.
- Economy... goes further than carbon black used with ordinary dispersion methods.

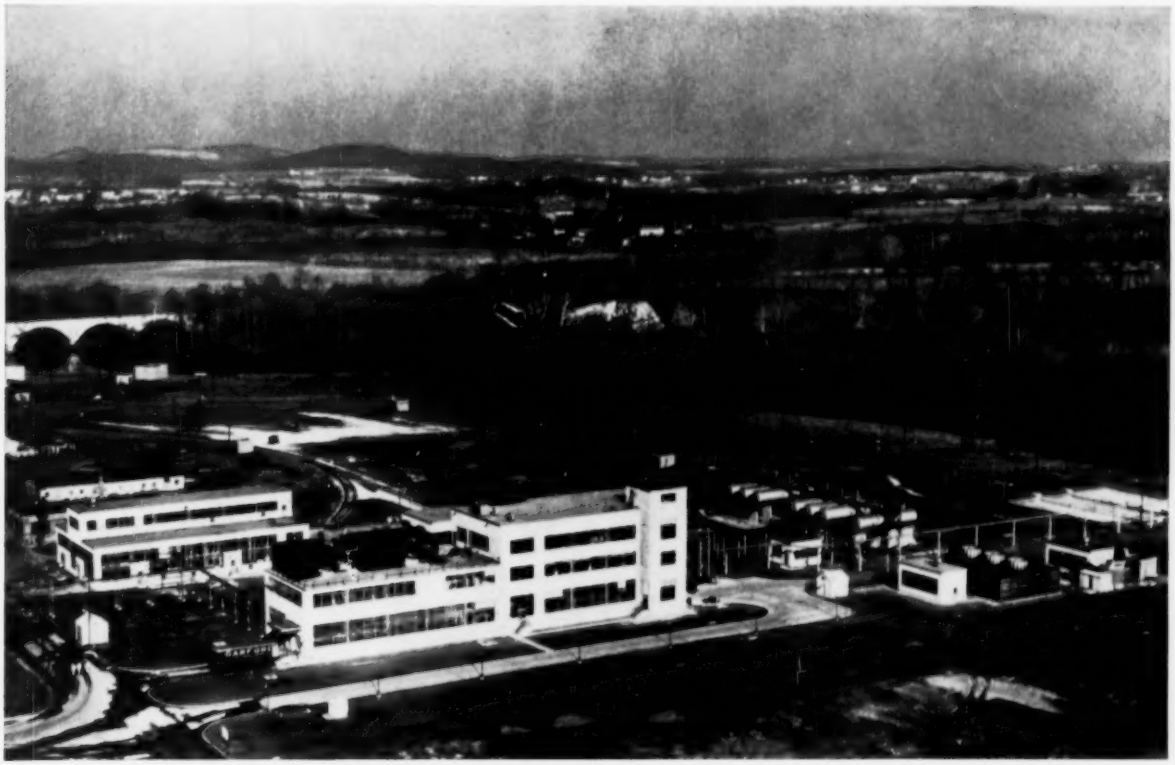
COLUMBIAN CARBON DISPERSIONS FOR EVERY PLASTIC

- COVINYLBLAKS®
- COSTYRENEBLAKS
- COETHLOBLAKS®
- COACETATEBLAKS

COLUMBIAN CARBON COMPANY

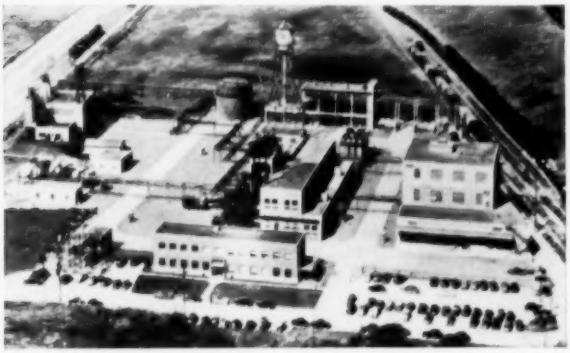
380 Madison Avenue • New York 17, N. Y.

● **COLUMBIAN** supplies Carbon Blacks in three forms: **POWDER · BEADS · DISPERSIONS** ●



Polyvinyl chloride resin plant of Firestone Tire & Rubber Co., designed and constructed by Blaw-Knox engineers

Polyvinyl acetate plant designed and built by Blaw-Knox for National Starch Products Inc.—later doubled in capacity by Blaw-Knox



Vinyl chloride monomer and polymer plant built for Glenn L. Martin Company and subsequently expanded for U. S. Rubber Company

Blaw-Knox has been building vinyl resin plants for over 10 years

Blaw-Knox is a pioneer in the design, engineering, and construction of complete plants for the resins and plastics industry. Included are new installations and expansion of existing facilities for both polymer and copolymer production. This extensive experience and accumulated technical "know-how" is available to you. We invite you to discuss your plans with our engineers.

BLAW-KNOX COMPANY

Chemical Plants Division • Pittsburgh 22, Pennsylvania • Chicago 1, Illinois

Birmingham • New York • Philadelphia • San Francisco • Washington, D.C.

Designers, engineers and builders of plants for production of Alkyd Resins • Amino Resins • Epon Resins • Oil Bodying • Phenol Resins • Silicone Resins • Synthetic Rubber • Vinyl Polymers and Copolymers • Polyesters

Baby Playthings

Toddler Toys

Housewares

Modern House Fittings

Outdoor Living Aids

Containers & Packaging

Symbols of your potential through Tupper Corporation

Premiums

● Whatever your custom needs in plastics manufacturing, call on Tupper's wide experience and modern manufacturing facilities. Our large, up-to-date plants, equipped with the best production machinery, are available for materials, injection molding, extruding, vacuum forming, blow molding—and other advanced processes.

The Tupper Engineering Department has developed the greatest number of patents in the industry for polyethylene seals, closures, and dispensers—and other items in other plastics. This know-how can be tapped by you to place your plastic products in a position of leadership.

Tupper seals and other Tupper products are protected against unauthorized manufacture by about 150 U. S. and foreign patents and patents applied for, plus numerous trademarks and copyrights.

Do-It-Yourself Materials

TUPPER CORPORATION

TUPPER! Trade-mark

Manufacturers of: CONSUMER, INDUSTRIAL, PACKAGING and SCIENTIFIC PRODUCTS

Factories, Laboratories and Sales Offices:
Massachusetts, Rhode Island, Florida, Montreal, New York

Address correspondence to:

Dept. M-4
Tupper Corporation
Woonsocket, R. I.

or

Dept. M-4
Tupper Corporation
225 Fifth Ave., N.Y.C.

CHEMORE CORPORATION 21 WEST STREET, NEW YORK 6, N. Y. TEL.: HA. 2-5275

EVERYBODY LIKES VIPLA

PVC RESIN

vipla

A MONTECATINI PRODUCT

PROMPT DELIVERY FROM STOCK
IN U.S.A. AND CANADA

NRM

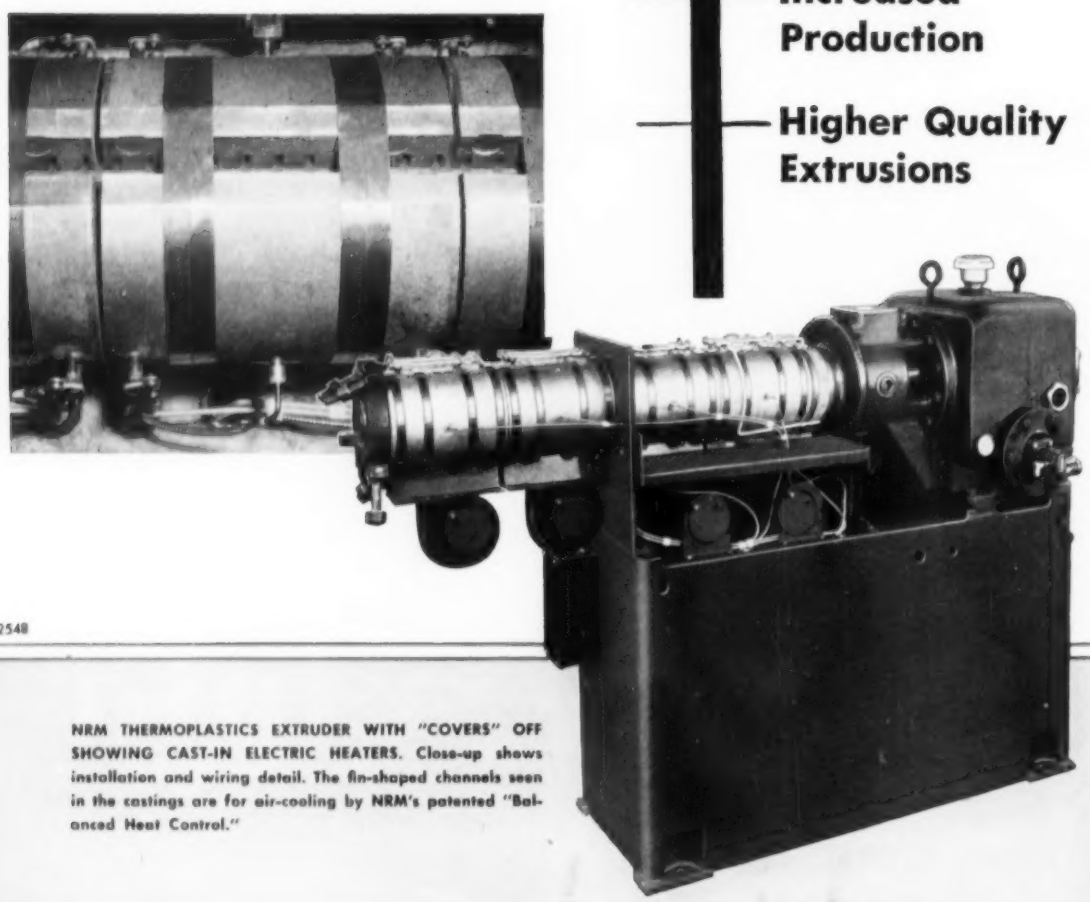
thermoplastic EXTRUDERS

with

Cast-in Heaters

assure

- **Less Extruder *"DOWN TIME"***
- **Increased Production**
- **Higher Quality Extrusions**



2548

NRM THERMOPLASTICS EXTRUDER WITH "COVERS" OFF SHOWING CAST-IN ELECTRIC HEATERS. Close-up shows installation and wiring detail. The fin-shaped channels seen in the castings are for air-cooling by NRM's patented "Balanced Heat Control."

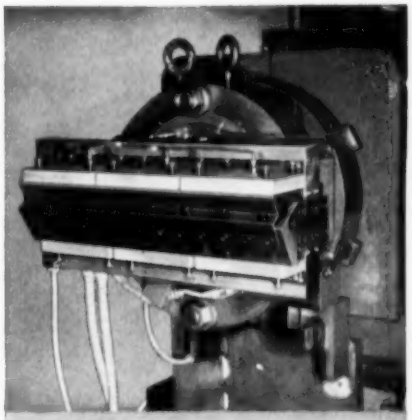
Check these reasons why . . .

UNIFORM HEAT TRANSMISSION — The continuous, uniform flow of heat so vital to quality plastics production is assured by NRM's system of cast-in heating. It consists of a series of half-circle aluminum castings like the one shown in the diagram. These clamp together to "jacket" the entire length of the cylinder. Balanced spacing of heating elements, and high conductivity of the aluminum assures equal distribution of heat throughout the casting, or "shell." Inner faces of the shells are machine-fitted to the cylinder, thus providing a virtually unobstructed and *uniform* flow of heat from the heat source to the plastic.

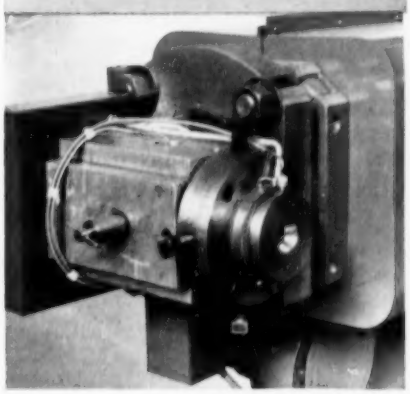
QUICK RESPONSE TO CONTROLS — There are no alternate "hot and cold" phases with NRM's cast-in heating. The aluminum shells store heat at controlled temperature, thus providing continuous heat to the plastic, even during the "off" cycle of the control system. Replenishment of the "stored" heat is almost instantaneous when heat input starts again.

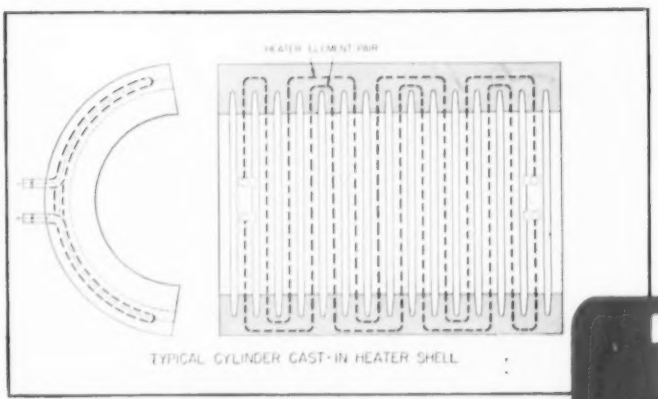
LONG LIFE OF HEATERS — Burn-outs, melt-outs, or almost *any* kind of heater failure is a rarity in NRM Extruders . . . Cast-in heaters have their elements safe *inside* their bodies . . . terminals are located safely away from the heat source, and connecting wires cannot become oxidized by ambiant heat. With less "down-time" for heater repair or replacement, you get substantially more *production* time from NRM Extruders.

PRACTICAL DESIGN — NRM's cast-in heater system permits compact, readily accessible installations . . . easier operation . . . space saving Extruders. Products of advanced electrical and metallurgical egineering, cast-in electric heaters provide the utmost in extruder efficiency, dependability and economy. That's why they are a *standard feature* on NRM Electrically Heated Extruders in all sizes.



NRM gives you the advantages of cast-in heating on many types of dies. Shown above is a pelletizing die, and below, a crosshead. Both are more compact and efficient with cast-in heating.





TYPICAL CYLINDER CAST-IN HEATER SHELL

2548

WRITE TODAY...

for more information on the NRM full line of Thermoplastic Extruders and Equipment. See for yourself how the many important NRM design and operating features — like cast-in heaters, for example — help make plastics extrusion more profitable.

NRM

NATIONAL RUBBER MACHINERY CO.

General Offices and Engineering Laboratories: 47 West Exchange St., Akron 8, Ohio. Hemlock 4-1961

EAST: 384 Getty Ave., Clifton, New Jersey.

SOUTH: The Robertson Company, Rutland Building, Decatur, Ga.

WEST: S. M. Kipp, Box 441, Pasadena 18, Cal.

MID-WEST: National Rubber Machinery Co., 5675 North Lincoln Ave., Chicago 45, Ill.

CANADIAN: F. F. Barber Machinery, Ltd., 157 Fleet St. West, Toronto, Ont.

EXPORT: Omni Products Corporation, 460 Fourth Ave., New York, N. Y.

Who knows about SPECIAL ADHESIVES for MYLAR* laminations?

Mylar adhesives have to be as versatile as the famous polyester film itself. Bond strength, clarity, resistance to light, even flow for machineability, affinity for a variety of surfaces . . . all are features needing careful control.

At Angier Adhesives, hundreds of laboratory and test hours have been focused on Mylar adhesives alone. There is an Angier adhesive for laminating Mylar to itself or to most other materials . . . to sheet metal as a lining . . . to aluminum foil as a vapor barrier . . . to leather as a surface protective . . . to vinyl film for decorative purposes . . . to asbestos paper for wire insulation, etc.

Who knows about Mylar adhesives? We ought to have most of the answers you need. Try us.

*MYLAR is DuPont's registered trademark for its brand of polyester film.

Write for more information on Angier's SB-6300 Mylar Adhesive Series.

For EVERY Industry: Latest developments in adhesives for Sandwich Panel Construction, Vinyl Film Bonding, also Rubber, Latex and Resin Cements, Pressure Sensitive Cements, Flocking Cements, Laminants, Sealants, Tie Coats and Resin Emulsions.

ANGIER ADHESIVES

Angier Adhesives

Division of Interchemical Corporation

120 POTTER STREET, CAMBRIDGE 42, MASS.

Midwestern Plant:
Huntington, Indiana

DESIGN FOR

CORROSION RESISTANCE

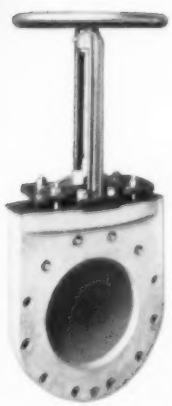
replace metal with molded polyester

You can get resistance to corrosion by acids and alkalies superior to stainless steel and Monel—at cost savings of up to 40%—by designing with Thermaflow reinforced polyester molding compounds. These materials also have excellent resistance to many organic solvents. They are stable at temperatures up to 300° F., and comparable in strength to aluminum castings. In addition, they offer you—

- **light weight—specific gravity 1.8**
- **high impact and flexural strength**
- **excellent electrical properties**
- **good surface finish—no machining needed**
- **one-piece production—metal fittings can be molded in place**
- **variety of colors—no finishing needed; paint, if desired, without bonding coat**

Thermaflow materials can be compression or transfer molded on standard presses at temperatures 275-350° F., pressures 400-900 psi. They can be molded readily in large, complex shapes with deep draw and intricate detail. Curing time is relatively short.

Write for data on the many grades of glass fiber and nylon rag reinforced Thermaflow materials, and on molding techniques and applications.



CORROSION-RESISTANT VALVE

withstands attack by strong acids and alkalies in paper mills. Readily absorbs vibration in pump lines, giving longer service life without leakage. Body is molded of glass-reinforced Thermaflow polyester. Designed and used by W. C. Rovang & Associates, Portland, Oregon; molded by Grant and Roth Plastics, Inc., Portland, Oregon.

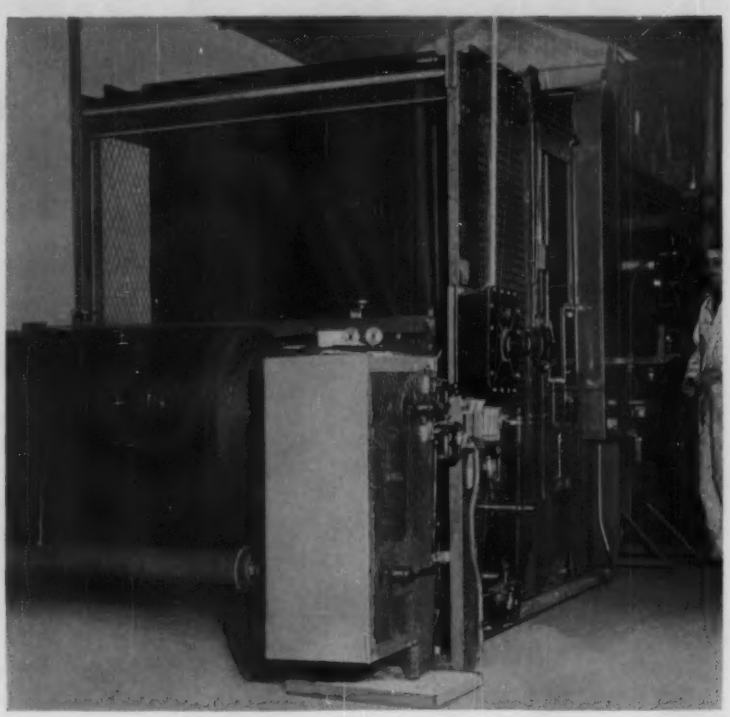
THERMAFLOW

ATLAS

ATLAS POWDER COMPANY
Chemicals Division
Wilmington 99, Delaware

laminates embosses and prints

in one operation



LEMBO LAMINATOR-EMBOSSER performs these 3 functions on all plastic film...

1 LAMINATES stretch back or drills *without adhesives!**

2 EMBOSSES

3 VALLEY PRINTS to closest tolerances

Compact, and costing only a fraction of mammoth equipment usually performing these jobs, it is especially practical for both short or long runs.

If your operation can benefit by fast, flexible equipment at considerably lower outlay and upkeep, you're invited to see the new LEMBO LAMINATOR-EMBOSSER in action. We will be happy to make experimental runs for you.

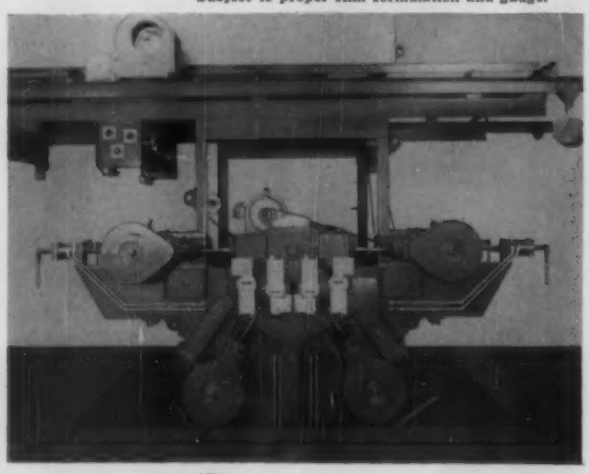
*Subject to proper film formulation and gauge.

LEMBO ROTOGRAVURE PRESSES

CUT DOWN SHUT DOWN! Hydraulic pressure on printing nips** permits operator to simultaneously back away all nips. Engraving rollers keep turning even while the printing machine is stopped. Ink doesn't dry on rollers. No wash-up needed. *Motorized Register Control* permits registry by operator from one position at panel board. Available, also, with electric eye.

Printers of all unsupported and supported plastic film prefer fast, quiet Lembo Rotogravure Presses for perfect, strain-free, in-register printing at speeds to 125 yards per minute. Shown right, 4-color – 52" between printing nips. Also, 6-color – 60" between nips.

**Optional equipment available at extra charge.



LEMBO
MACHINE WORKS, INC.
248 EAST 17th St. • Paterson 4, N. J. • Lambert 5-5555
Mfrs. PRESSES • EMBOSSERS • LAMINATORS • ROLLERS

ROTOGRAVURE LEMBO PRESS LAMINATION

U.S.I.
Vol. II, No. 2

POLYETHYLENE PROCESSING TIPS

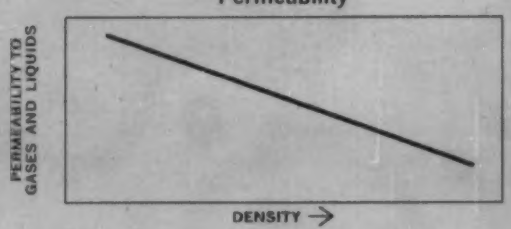
HOW RESIN DENSITY AFFECTS POLYETHYLENE PROPERTIES

The *density* of a polyethylene is one of three basic characteristics which determine the properties of a processed part. The other two basic characteristics are *molecular weight* and *molecular weight distribution*. Relationships among the three were discussed in Tips, Vol. 2, No. 1 (reprints are available).

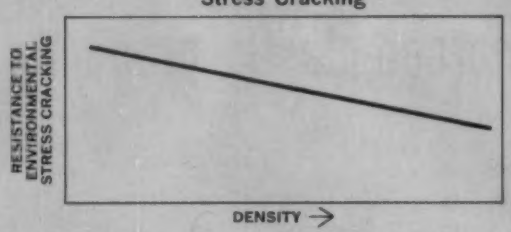
Polyethylene density can range from 0.910 to 0.965. The graphs below indicate what happens to certain properties as density of the resin increases, assuming the other two basic characteristics do not change.

It must be remembered, though, that these graphs do not give the entire story. Molecular weight and molecular weight distribution are often different in resins of different densities, so the effects of all three must be taken into consideration if the end properties are to be predicted. The effects of these other characteristics on end properties will be discussed in future issues of "U.S.I. Polyethylene Processing Tips".

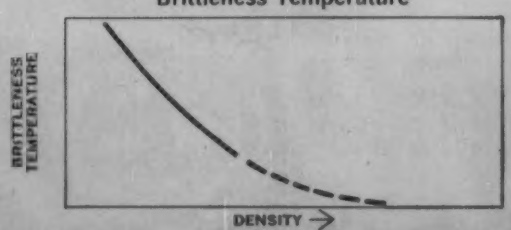
Permeability



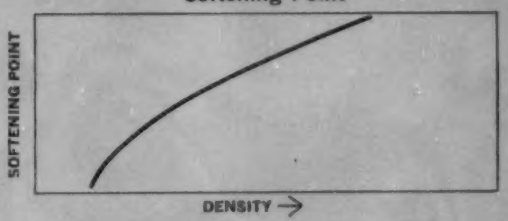
Resistance to Environmental Stress Cracking



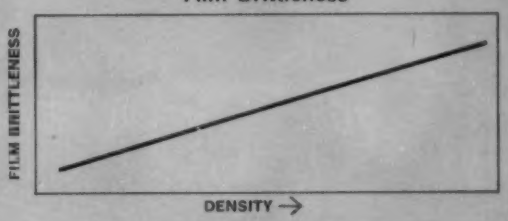
Brittleness Temperature



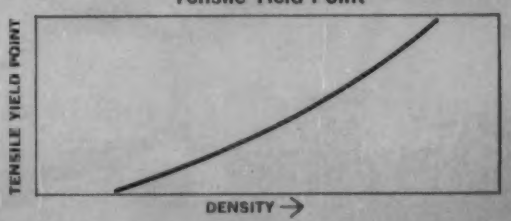
Softening Point



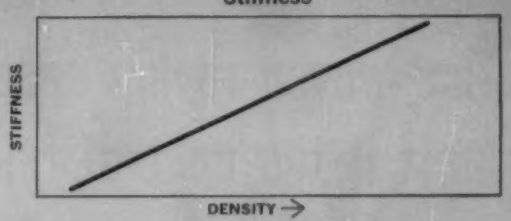
Film Brittleness



Tensile Yield Point



Stiffness



U.S.I. PETROTHENE® Polyethylene resins are now available in densities up to 0.925 and will soon be available over a wider density range. Molecular weight and molecular weight distribution can also be varied at will.

U.S.I. technical service engineers will be glad to work with you to determine what resin characteristics can give you the properties most suitable for the polyethylene product that you are making—or plan to make.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers Products Corporation
99 Park Avenue, New York 16, N. Y.
Branches in principal cities

Garan woven roving helps build high speed, clean lines, and great strength into glass-reinforced plastic boats like this 22′ Vagabond cruiser by Crosby Aeromarine, Grabill, Ind.

Garan® woven roving speeds build-up . . . helps cut the cost of reinforced-plastic products

You can cut costs . . . build stronger glass-reinforced plastic products with Garan woven roving. Here's why:

Garan woven roving speeds production and reduces material costs because its greater bulk allows faster build-up, using fewer thicknesses of reinforcement. It conforms well to the mold; bonds to resin more quickly for faster, stronger laminating. Garan woven roving needs no additional treatment before use. You get a reinforcement with higher strength . . . and you save the cost of treatment.

In reinforced-plastic products like boats, chemical piping, tooling fixtures, swimming pools and radomes, Garan woven roving provides: strength to withstand extreme abuse; dimensional stability to hold close tolerances.

Find out today how *you* can profit from the special strength and laminating characteristics of Garan woven roving.

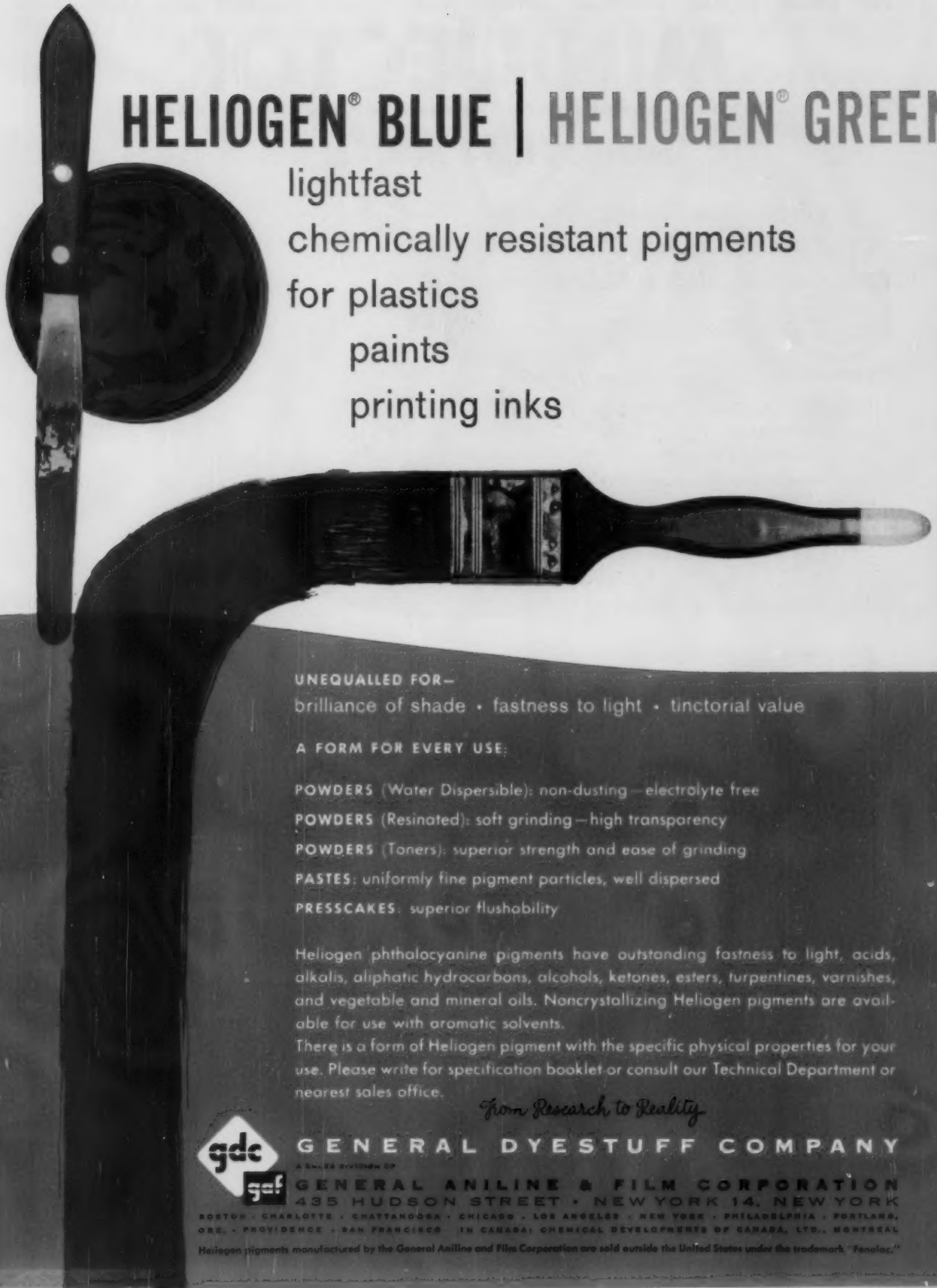
L·O·F GLASS FIBERS

Write Dept. 15-37 for sources of supply

L·O·F GLASS FIBERS COMPANY • TOLEDO 1, OHIO

HELIOGEN® BLUE | HELIOGEN® GREEN

lightfast
chemically resistant pigments
for plastics
paints
printing inks



UNEQUALLED FOR—
brilliance of shade • fastness to light • tinctorial value

A FORM FOR EVERY USE:

POWDERS (Water Dispersible): non-dusting—electrolyte free
POWDERS (Resinated): soft grinding—high transparency
POWDERS (Toners): superior strength and ease of grinding
PASTES: uniformly fine pigment particles, well dispersed
PRESSCAKES: superior flushability

Heliogen phthalocyanine pigments have outstanding fastness to light, acids, alkalis, aliphatic hydrocarbons, alcohols, ketones, esters, turpentines, varnishes, and vegetable and mineral oils. Noncrystallizing Heliogen pigments are available for use with aromatic solvents.
There is a form of Heliogen pigment with the specific physical properties for your use. Please write for specification booklet or consult our Technical Department or nearest sales office.

From Research to Reality

gdc gaf

GENERAL DYESTUFF COMPANY
A SALES DIVISION OF
GENERAL ANILINE & FILM CORPORATION
435 HUDSON STREET • NEW YORK 14, NEW YORK
BOSTON • CHARLOTTE • CHATTANOOGA • CHICAGO • LOS ANGELES • NEW YORK • PHILADELPHIA • PORTLAND, ORE. • PROVIDENCE • SAN FRANCISCO IN CANADA: CHEMICAL DEVELOPMENTS OF CANADA, LTD., MONTREAL

Heliogen pigments manufactured by the General Aniline and Film Corporation are sold outside the United States under the trademark "Fanalac."

For Under $1,000, You Can Develop and Produce Small Plastic Items with

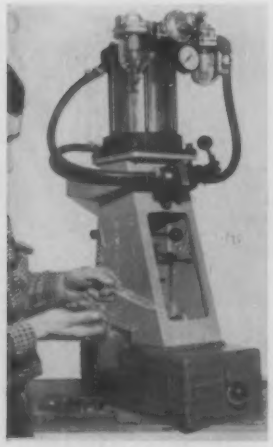
MINI-JECTOR

TRADE MARK

PLASTIC INJECTION MOLDING MACHINES

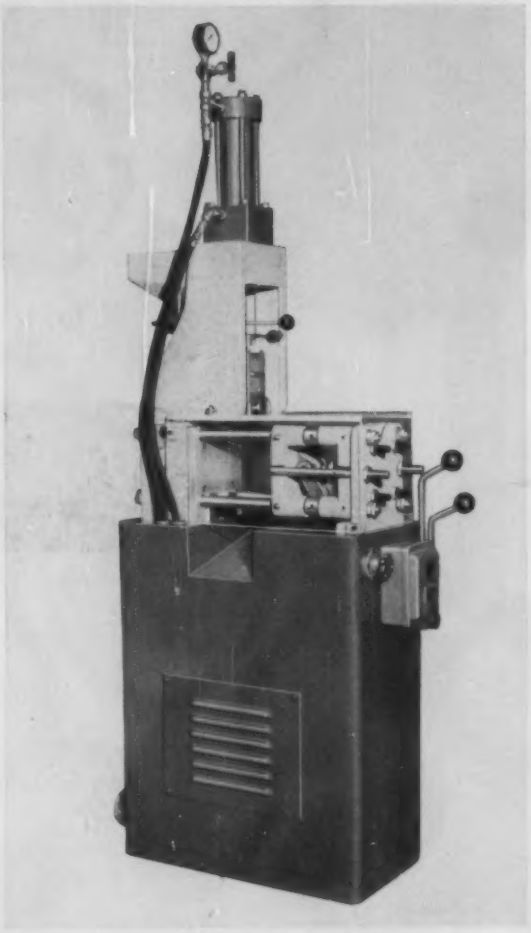
Users Report New Economy, Efficiency in Development, Samples and Production of ⅓ oz. to 1 oz. Injection Molded Products

Unsurpassed *flexibility!* That's how MINI-JECTOR saves you important manhours and capital expenditures. Discard expensive methods of developing small plastic items. Avoid big press "high-per-piece costs". Eliminate high tooling charges. At only a *bare fraction* of former time, trouble and money, MINI-JECTOR develops the item, then follows-up with quick-thousands of perfect samples, and finally, steady, moderate production. Simple to operate. Molds unlimited variety of small items (⅓ oz. to 1 oz.) in all thermo-plastic materials, including Nylon. MINI-JECTOR in your plant will pay for itself many times in *savings alone.*



MODEL 45 "WASP" ¾ oz. capacity air-operated Mini-Jector . . . fast and economical. 6" air cylinder operates ram . . . 40 to 150 pounds of air pressure required depending on type of plastic used and product being molded. Material hopper capacity 4 pounds.

MODEL 50 "WASP" a new Mini-Jector . . . capacity 1/3 oz. to 1 *OUNCE* at pressures up to 30,000 PSI. This is an ideal model for precision insert work with any type of plastic. Hydraulically operated.



MODEL 60-PC 75 "HORNET" POWER OPERATED LEVER CONTROLLED. Mold size 6" x 5" x 5⅛"

Newest of the time-tested, performance-proved MINI-JECTORS offers many exclusive features. Finest 4-tie rod construction. Cyl. and ram quickly interchangeable. Simple tooling. Parting-line sprued molds. Molds bolt to platens, cells removable. Molded part ejection, cavity-cell push-out are part of mold. Preferred for larger area items or production runs. Simple to operate. ⅓ oz. to 1 oz. cap. Up to 30,000 p.s.i. on material. ¾ oz. model hydraulically operated (Vickers), complete, ready to operate, under $2,000.

EVERY DAY THOUSANDS OF ITEMS ARE BEING PRODUCED PROFITABLY ON MINI-JECTORS

Bring your problems to Newbury! Our pilot plant can help you solve your tricky, small-item (up to 1 oz.) development and production difficulties.

WRITE TODAY . . . for literature telling how Mini-Jector may help solve your injection molding problems, to . . .

NEWBURY INDUSTRIES, Route 87, Newbury, Ohio

"Specializing in the Production and Development of Plastic Injection Molding Machines up to one ounce capacity."

Whether it's CRASH HELMETS OR TOTE BOXES

KEY-TOPS OR TRAYS – DRIP PANS OR PUSH BUTTONS . . .

AMERICAN IS YOUR ANSWER

FOR PRECISION MADE PLASTIC PARTS

Whatever your industry or plastic part requirements, American's your answer. One of the nation's oldest and largest manufacturers of plastics, American offers facilities for injection, compression, extrusion, double-shot injection molding and low pressure and vacuum assisted molding. American's ultra-modern equipment can mold most types of plastics, including cellulose acetate and butyrate, polystyrene, acrylics, reinforced fibreglass and copolymers. American's giant plant can handle every stage of manufacture from design to mass production. Regardless of whether your plastic problem is clear-cut or complex . . . regardless whether your needs are small or large, call upon American for the economical, quality answer. Write direct for further information today. Address Dept. A

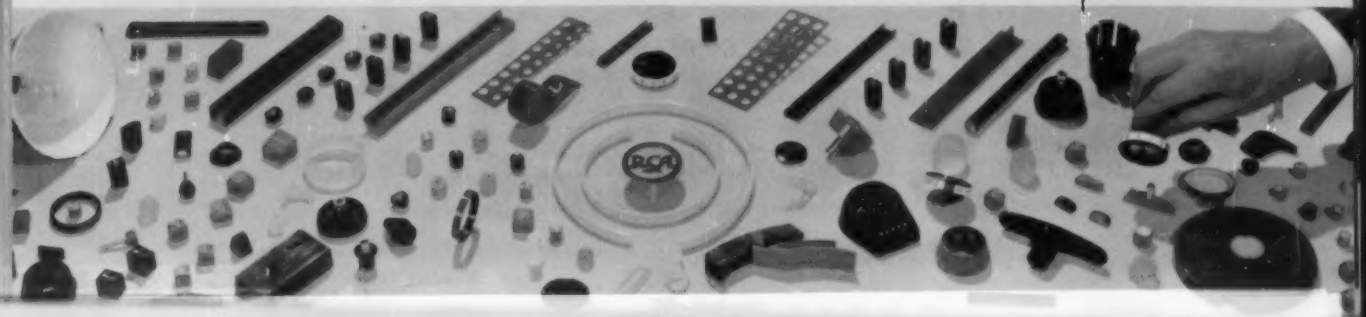
A P C
PRECISION MADE

AMERICAN PLASTICS CORPORATION

A Subsidiary of Heyden Chemical Corporation

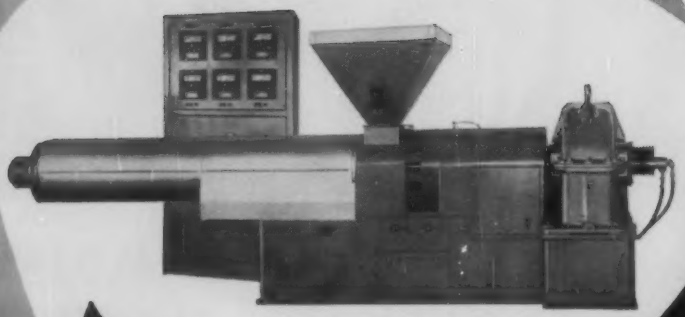
EXECUTIVE OFFICES: 342 MADISON AVENUE, NEW YORK 17, N. Y.

Plastics Production Partner of America's Most Progressive Manufacturers



extruders by *Egan*

From 2" Thru 8" with screw lengths of 16 or 20 Diameters. • Hard corrosion resistant liners. • Heavy duty thrust and radial bearings with force feed lubrication. • Completely prewired temperature control cabinet. • Screw speed tachometer. • Precision ground screws. • Large feed hopper with sight glass and cut-off slide. Complete installations for film, sheet, pipe, shapes.



THE EGAN 8" EXTRUDER

Delivery From 3 Weeks

Our new plant in Somerville, N. J. with increased facilities enables us to offer prompt delivery on most sizes of extruders.

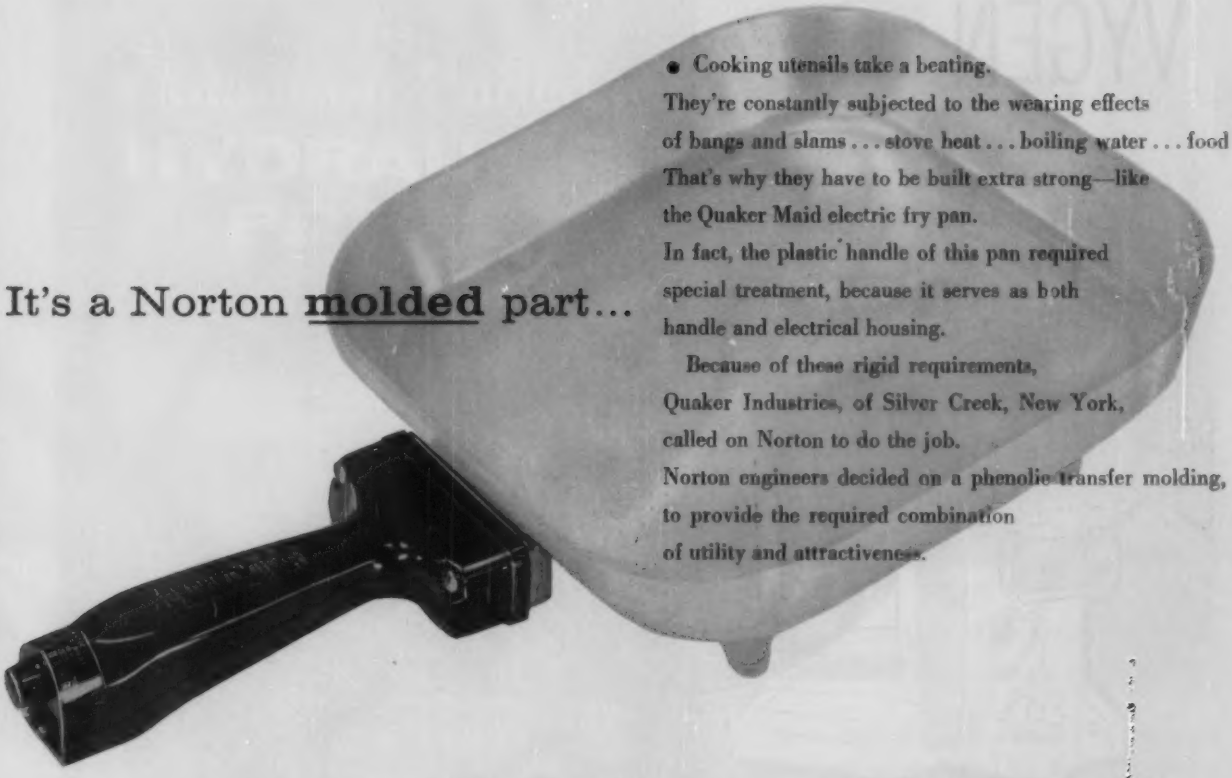
Write or Phone Today For Complete Information—No Obligation.

FRANK W. EGAN & COMPANY, Somerville, New Jersey

Designers and Builders of Machinery for the Paper Converting and Plastics Industries

Cable Address: "EGANCO"— Somerville, Nier.

Representatives:
MEXICO, D. F. — M. H. Gottfried, Avenida 16 De Septiembre, No. 10.
Licensees: GREAT BRITAIN — Bone Bros. Ltd., Wembley, Middlesex. FRANCE — Achard-Picard, Remy & Cie, 36 Rue d'Enghien Xe, Paris. ITALY — Emanuel & Ing. Leo Campagnano, Via Borromei 1 B/7, Milano. GERMANY — ER-WE-PA, Erkrath, bei Dusseldorf.



It's a Norton **molded** part...

• Cooking utensils take a beating.
They're constantly subjected to the wearing effects of bangs and slams . . . stove heat . . . boiling water . . . food acids.
That's why they have to be built extra strong—like the Quaker Maid electric fry pan.
In fact, the plastic handle of this pan required special treatment, because it serves as both handle and electrical housing.

Because of these rigid requirements, Quaker Industries, of Silver Creek, New York, called on Norton to do the job.
Norton engineers decided on a phenolic transfer molding, to provide the required combination of utility and attractiveness.

for a completely Norton **assembled** product

Besides molding the handle, Norton assembled all the components—body, handle, heating element, cord and cover—into finished, ready-to-use fry pans.
This additional step is a good example of how the Norton organization can shoulder an entire manufacturing project—a service especially helpful to a company introducing a new product.

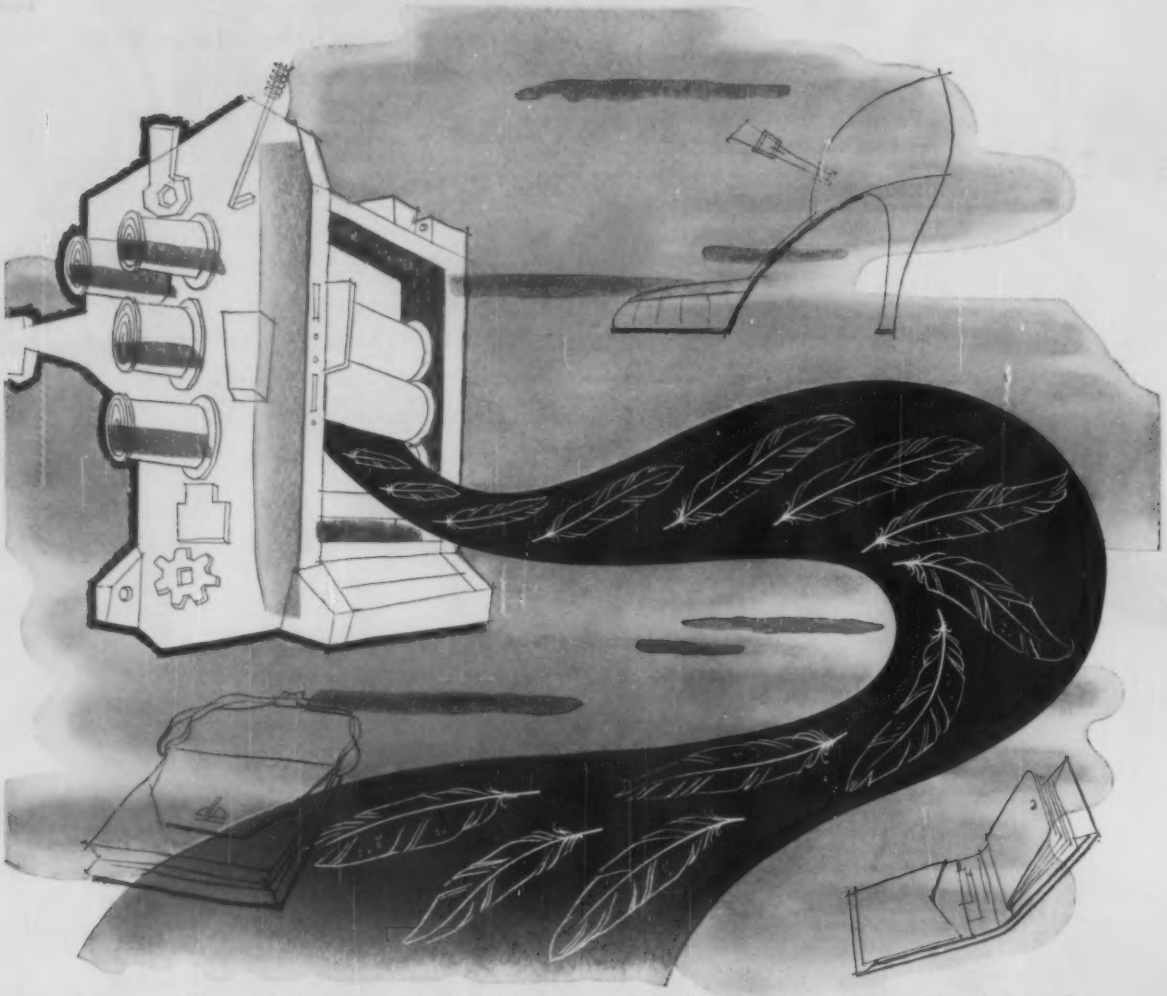
Norton Laboratories, Inc., Lockport, New York
Sales Office: New York—175 Fifth Avenue
(Chicago) Elmhurst, Ill—203 Elm Square Building
Cleveland—20605 Kings Highway
Detroit—7-266 General Motors Building
Philadelphia—4719 Longshore Street
Rochester—739 Powers Building

NORTON *Laboratories, Inc.*

COMPRESSION AND INJECTION MOLDING

VYGEN PVC RESIN

Ideal for stylish, light embossing



The trend toward light-embossed vinyl sheeting for fashion items could create serious production problems in your plant. Light-embossing on sheets calendered of ordinary vinyl resin often causes lumps and troublesome surface imperfections. You can eliminate those profit-wrecking problems with VYGEN® PVC resins. VYGEN PVC resins have excellent heat stability during processing (prevents color variations), closely-controlled molecular weight (assures processing uniformity), and a very uniform rate of solvation (minimizes surface imperfections).

Be sure you can supply the high-quality, light-embossed vinyl sheeting required for handbags, shoes, novelties and other uses — be sure you use VYGEN PVC resins. For more detailed information on the VYGEN resin to use in your operation, write to *The General Tire & Rubber Company, Chemical Div.*

Creating Progress Through Chemistry

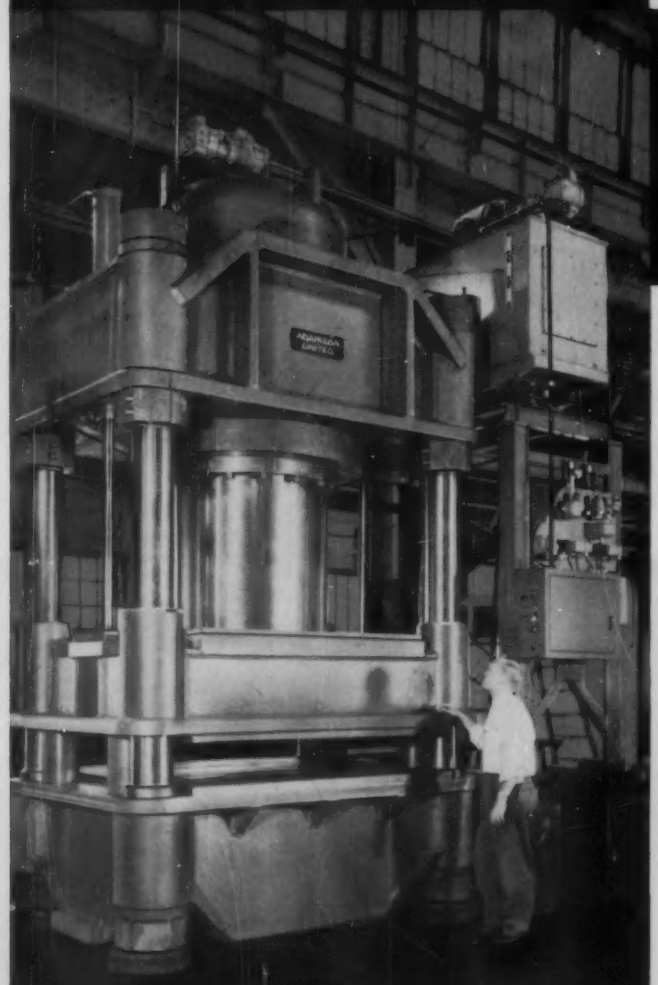
THE GENERAL TIRE & RUBBER COMPANY

CHEMICAL DIVISION • AKRON, OHIO

Chemical Division GENERAL THE GENERAL TIRE & RUBBER CO. VYGEN

THIS

Adamson United HYDRAULIC PRESS



Engineered to customer's special requirements . . .

WAS

DESIGNED . . . BUILT and TESTED

in less than 6 months

ANOTHER EXAMPLE OF THE ABILITY AND VERSATILITY OF ADAMSON ENGINEERING AND PRODUCTION

Our customer's requirements necessitated an entirely new design of hydraulic press. Starting from scratch, Adamson engineered, built and tested for service, this 1450 ton unit within a period of 6 months.

We have hundreds of standard press designs available, but when something *special* is required, we go "all out" to meet your needs. Every piece of new equipment is thoroughly tested on our erection floor in the customer's presence; and we supply competent technical assistance for first run operations if requested.

Why not talk over your press requirements with us . . . any time . . . without obligation?

Platen Size	76" x 76"
Total Hydraulic Pressure	1450 Tons
Stroke	40"
Daylight	50"
Ram Diameter	40"
Pull-Back Cylinders (2)	6"
Variable Volume Pump	
Compensator Control	

Adamson United Company

730 Carroll Street • Akron 4, Ohio

SALES OFFICES IN PRINCIPAL CITIES

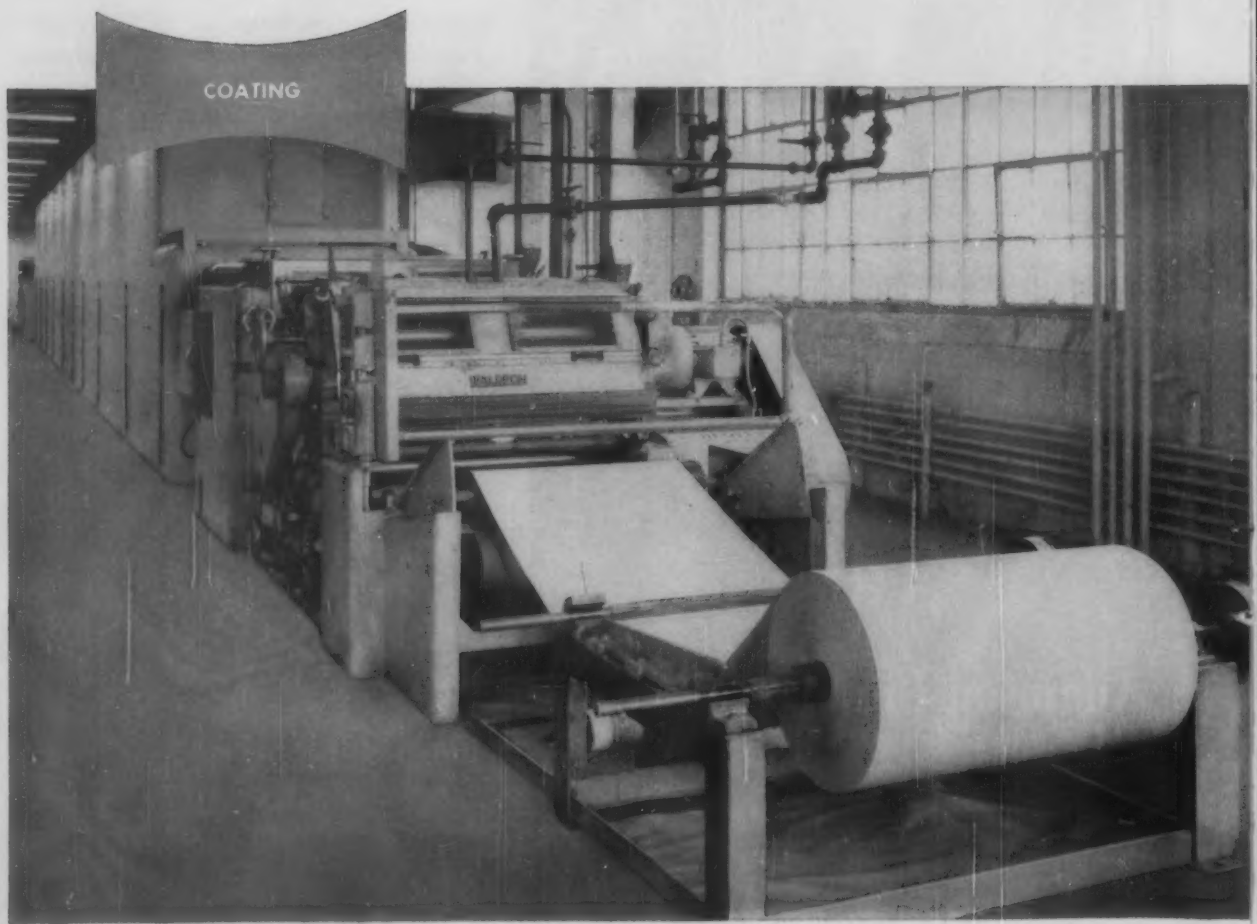
Subsidiary of United Engineering and Foundry Company

Plants at: PITTSBURGH • VANDERGRIFT • YOUNGSTOWN • CANTON • WILMINGTON (Lobdell United Division)

DESIGNERS AND BUILDERS OF BASIC MACHINERY FOR THE RUBBER, PLASTICS AND PLYWOOD INDUSTRIES

WALDRON *Specialists in*

Founded
in 1827,
we are now
in our 130th year
as a continuing
business



WEB PROCESS ENGINEERING

ENGINEERING COMES FIRST For more than a century our engineering talents have been focused on the basic problems of processing 'webs' of paper, plastic, cloth or metal or combinations of two or more such materials. We have been among the first to take up the problems inherent in new 'web' materials as they have come on the market.

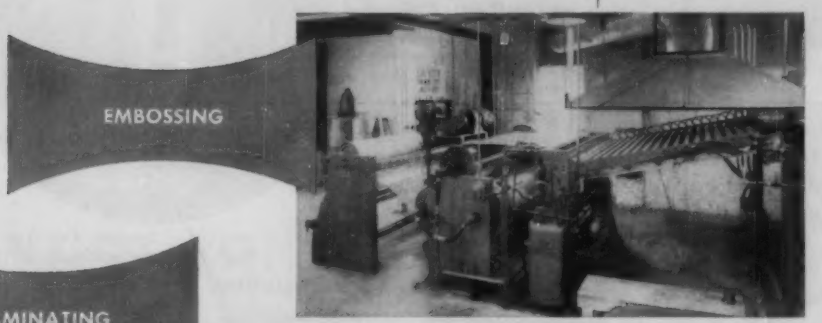
In our many years of service to industry we have worked on problems of and designed machines for such treatments as coating, laminating, crepeing, embossing, gumming, waxing, printing, varnishing, saturating and impregnating. Practically any web treatment is within the scope of our service.

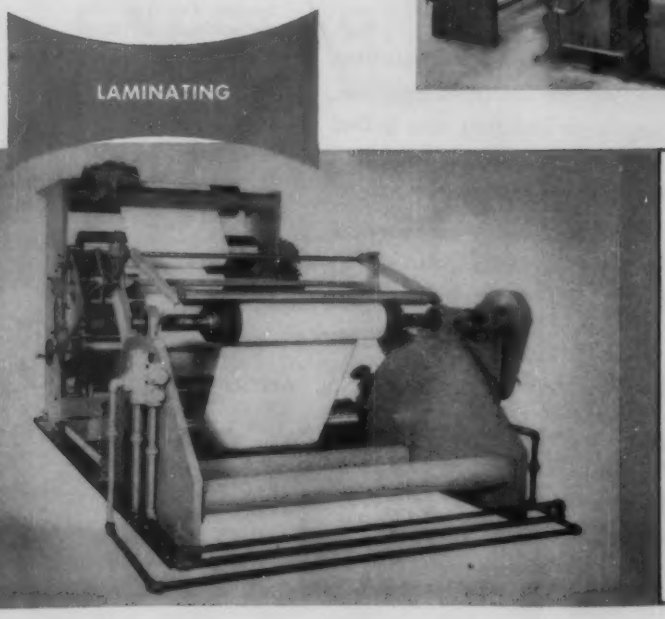
THEN MANUFACTURING One of the interesting facets of this kind of work is that seldom are two problems alike. For this very reason, it has been a Waldron policy *not* to standardize. Every Waldron Processing machine is custom designed and custom built. Stock units at best can only approximate. Custom engineered units assure maximum efficiency, best cost structure and the most consistently satisfactory end product.

Perhaps you would like to discuss tentatively your plans for 'processing a web'. One of our experienced engineers will be glad to call. Let us know when it will be convenient. If you will also outline the general nature of your requirements, we will be glad to send you suitable literature for study preliminary to his call.

John **WALDRON** Corporation

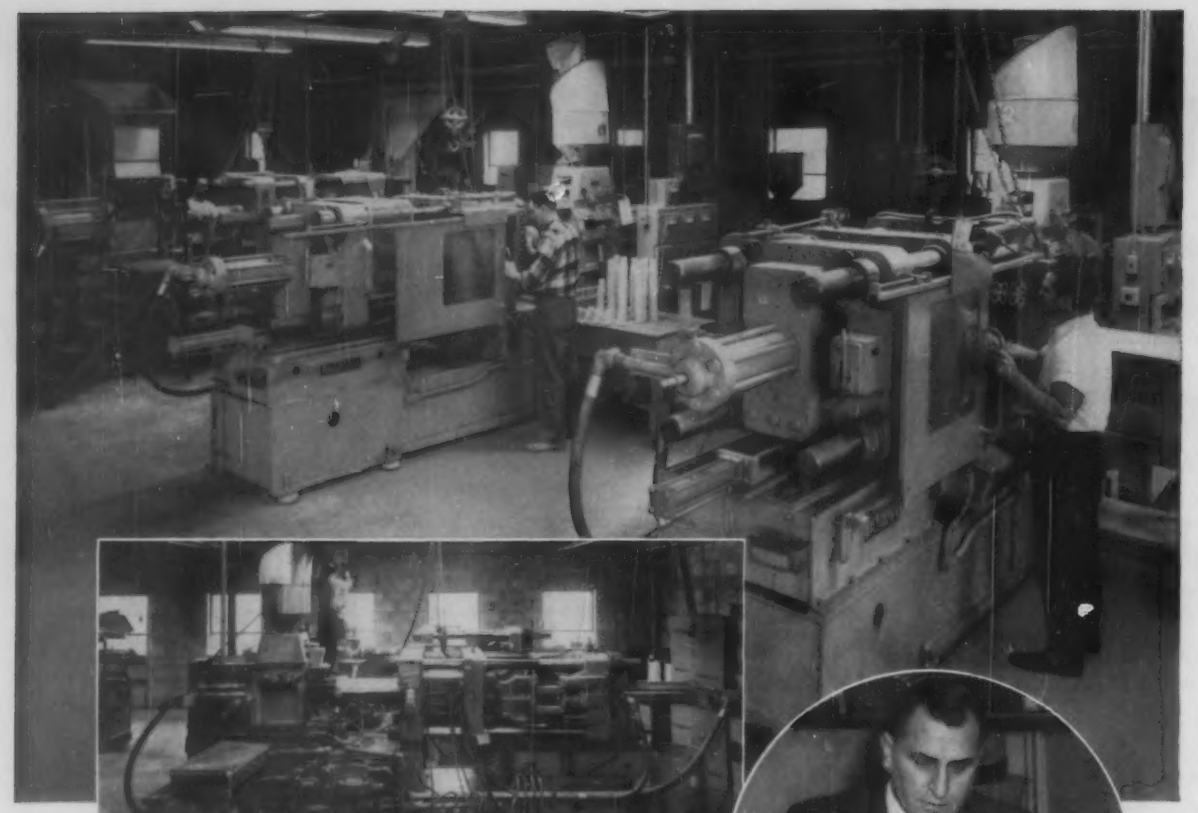
P. O. BOX 791 • NEW BRUNSWICK • NEW JERSEY





Auxiliary Equipment

In addition to equipment which is classed as 'processing', we make an extensive line of auxiliary equipment such as Automatic Web Guides, Festooning Machines, Brush Polishers, Slitters, Rolls, Winders and Unwinds, Web Controls. These units are suitable for installation with existing processing units.



Partial view of Plastic Academy's new modern Injection Molding Department

President Felo Tocci Plastic Academy Products Corp., Leominster, Massachusetts

FIVE AT WORK
No. 6 coming up!

Mr. Tocci is shown signing his order for his sixth Lombard machine. He states, "When I first saw the blueprints of the Lombard machine, I was so impressed with the features they were building into it that I bought my first machine sight unseen. Today we have five Lombards working day in and day out, giving us continuous, satisfactory service."

Mr. Tocci is just one of our many customers who have re-ordered our machines. Let us prove that you too can be a satisfied customer by test molding your molds on the finest and fastest machines in the world — The Lombards.

Send for bulletin on Lombard Injection Molding Machines today.

LOMBARD GOVERNOR CORP.

Injection Molding Division

ASHLAND, MASSACHUSETTS, U. S. A.

New York Area Sales Representative: The RAINVILLE Co., 647 Franklin St., Garden City, N. Y.

Why CYCOLAC®?

HIGH-IMPACT THERMOPLASTIC RESIN

. . . in the S & C LOADBUSTER Circuit-Breaking Unit!

The Answer is simple:

The S & C Electric Company's "LOADBUSTER", a unique new device which enables an electrical lineman to open switches on heavy power lines, without "pulling an arc" . . . demanded the use of CYCOLAC!

CYCOLAC's low coefficient of friction . . . high impact strength . . . excellent electrical properties . . . toughness and resilience . . . dimensional stability . . . resistance to wear and abrasion . . . moldability to exacting tolerances . . . and excellent low-temperature strength PROVED THE ANSWER FOR THE "LOADBUSTER".

Some of the 1,001 End Products ready to be made with...

CYCOLAC

- Chemical & Industrial Piping
- Molded Pipe & Industrial Fittings
- Corrosion-proof Valve Bodies
- Signs — Display Racks
- Desk Tops
- Profile Extrusions
- Beverage Dispensers
- Tote Boxes
- Carpet Sweeper Housing and Wheels
- Kitchen Accessories
- Appliance & Tool Handles

CYCOLAC is a single uniform resin which is permanently thermoplastic, permitting fast molding, calendering and extruding, and re-use of trim and cutting scrap. Also economical to form from press-polished sheets by vacuum, air-pressure, or mechanical methods over inexpensive molds of wood, plaster, aluminum, etc.

CYCOLAC is free from nerve or shrinkage; with a high in impact-resistance and heat-distortion temperature, plus a low brittle point. Resistant to many oils, solvents and corrosive chemicals.

Very light — Sp. Gr. 1.01 . . . dimensionally stable . . . soluble in selected solvents, for potential coatings applications. Readily injection-molded, extruded and calendered.

Get the Facts...

Write **today** for Technical Literature

MARBON CHEMICAL

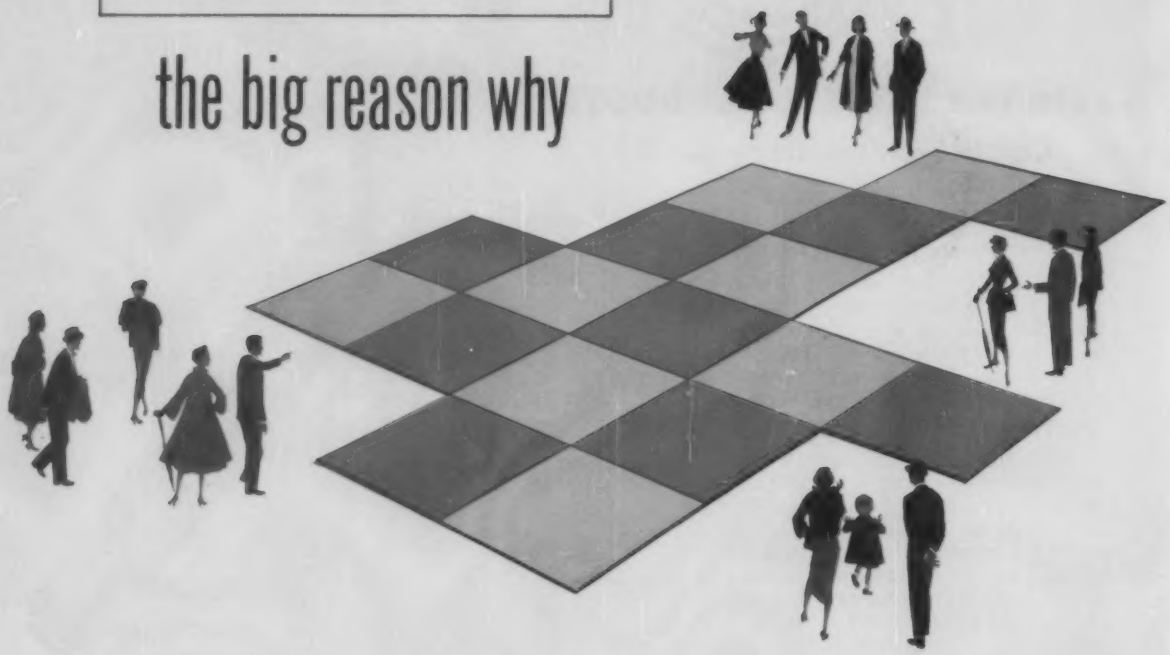
Division of BORG-WARNER

GARY, INDIANA

MARBON CHEMICAL . . . *Precision Resins for Precision Made Products*

PERMANENCE...

the big reason why



PLASTOLEIN® 9720 Polymeric
is preferred for vinyl floor tile

It will pay you to investigate Plastolein 9720 Polymeric because it provides the extreme permanence and durability so vital to the life of your vinyl flooring. This results primarily from 9720's outstanding performance relating to such factors as dimensional stability, heat and light stability, volatility, and extraction.

Plastolein 9720 also offers these cost reducing advantages: low plasticizer cost, relatively high efficiency, low filler absorption, and the efficiencies of easy processing. Also, though 9720 is a polymeric, its relatively low viscosity permits the economies of bulk shipping and handling.

With all these advantages, why not try Plastolein 9720 in your vinyl tile formulations—or in any formulation where permanence is essential.

For complete details on 9720 or any of the Plastolein Plasticizers, mail coupon below:

Emery

Organic Chemical Sales Department

Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio

Emery Industries, Inc., Dept. F-4, Carew Tower
Cincinnati 2, Ohio

Please send 32-page Emeryfacts describing all the Plastolein Plasticizers.

Name.....Title.....

Company.....

Address.....

City.....State.....

MODERN PLASTICS
Volume 34
April 1957
Number 8

Plastics in disposables and expendables

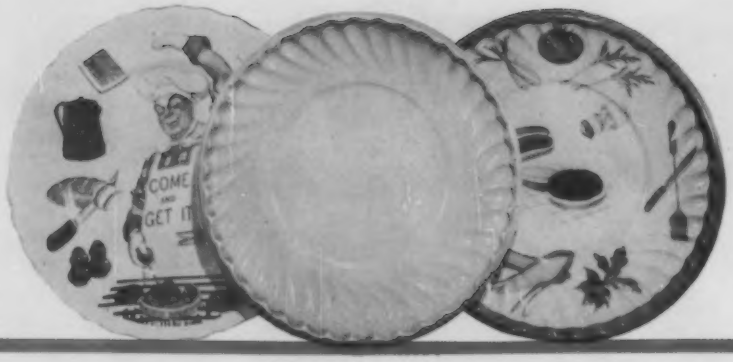
Lower-cost materials, improved materials, and automation in processing are keys to a vast new market

A major problem in the marketing of disposable and expendable merchandise made of plastics, according to sales managers of companies concerned, is the disinclination of consumers to accept the fact that such merchandise has been designed to be, and therefore should be, discardable and destroyable.

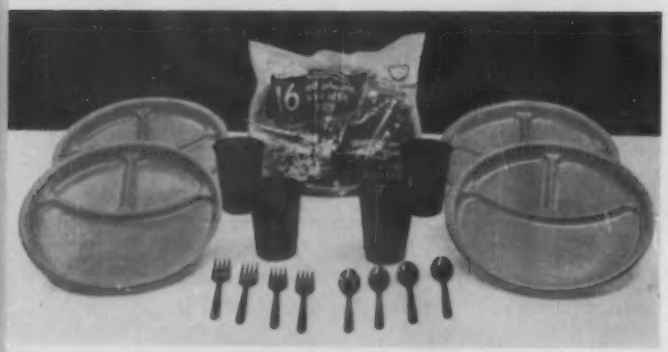
A decade ago, when thermoplastics materials were more expensive, when plastics processing methods were slow, when materials for thin-section products were few and weak, the plastics industries were at some pains to stress durability and re-use value of plastics products, including packaging, and to educate consumers in the proper care of plastics merchandise. Since plastics products, disposable or not, are pleasant to the eye and to the touch, and inevitably have some durability, consumer habits of saving plastics items for re-use, developed at that time, hang on.

The earliest development of disposable plastics merchandise came in the packaging field, first through films and later through molded and formed containers. With increases in costs of non-plastics materials, with the development of higher-strength thermoplastic resins at lower cost, and with automation in molding and thermoforming, plastics began to compete with glass, metal, and paper in the packaging field. Even then there was much emphasis on plastics containers re-use, particularly for the refrigeration of leftovers. This situation is rapidly changing, as pointed up in an address before the 1956 National S.P.I. Conference given by Lloyd Stouffer, editor of *Modern Packaging Magazine*. Said Mr. Stouffer, "your developments should be aimed at low cost, big volume, practicability, and *expendability*. Your future (in this field) is in the garbage wagon!"

From molded cream cheese or ice cream packages to drinking cups for automatic vending machines serving hot and cold beverages was a short step. From packaging films to disposable temporary storm windows was not far. Particularly when polyethylene became more available and when the higher-strength sty-



Decorated picnic plates formed of styrene laminate have a use cost considerably lower than that for plates made of paper



Semi-disposable picnic set consists of formed styrene alloy plates, molded styrene utensils, molded polyethylene tumblers

renes comes into play, the trend toward the development of disposable and expendable plastics merchandise was accelerated.

Rosily astronomical

The statistical picture of the markets in disposables and expendables now dominated by paper and glass, which plastics are invading, is rosily astronomical. Parts of this market picture will appear in context later in this article. A less rosy view comes with the realization that, for uses ranging from drinking straws and swizzle sticks and toothpicks through one-use cleaning mitts and picnic dishes to industrial expendable items, plastics are generally three times as expensive per pound as materials with which they compete. The secret of success lies in the most efficient use of each pound of plastics as well as in the advantages of the plastics disposable products, even at a higher price. There are a few instances, of course, such as in the storm window film field, in which properties of plastics enable them to perform a function impossible for traditional materials.

Sundae dishes formed of thin-gage styrene alloy sheet are finding growing acceptance by ice cream vendors. (Photos, Federal Tool Corp.)

Artists can mix colors more conveniently by using inexpensive, disposable cups vacuum formed of high-impact styrene sheet material

Battery of injection machines molding thin-wall styrene cups. Conveyor at left carries the molded cups to packing area. (Photo, The Dow Chemical Co.)

Styrene picnic cups are packed in polyethylene bags, six to a bag. Retail price is approximately 3¢ per cup

It will not be the purpose of this article to discuss the more obvious proprietary plastics disposables such as pressure-sensitive bandages, corn plasters, and tape. The discussion will be limited to products for markets now opening up.

Rather than disposable, the term "limited use" might be used in describing plastics products in this category. An example is thermoformed styrene laminate picnic plates. The Ullman Co., New York, N. Y., produces a wide variety of these in which the multi-color printing is handled in reverse on the back surface of the overlay sheet. (Photo p. 94.) This gives a product with a tested life of up to 30 uses at a retail price of 15¢ each, giving a use cost of ½¢ per use, compared with a use cost of 3¢ to 5¢ for high-quality paper plates.

In the same category are compartmented thermoformed plates, one supplier of which is Federal Tool Corp., Chicago, Ill. Federal's compartmented plates are produced on a continuous extrusion-vacuum forming setup which holds costs to a minimum since it is largely automatic. High-impact styrene alloy sheet is the material used for these plates. One assortment marketed through variety stores, supermarkets, and other mass-market outlets, is a 16-piece all-plastics picnic set (photo p. 94) which includes four 8-oz. molded polyethylene tumblers, four re-usable plates, four spoons, and four forks. This set, sold in a printed cellophane or polyethylene bag, retails at slightly less than a dollar. The point is that while some consumers will wash and re-use these products because of their sturdiness, they are low enough in cost to be discarded after one or two uses, if desired.

Automatic production

An item which is related marketwise to the above examples is the injection molded disposable styrene alloy cup (photo above) produced by Crown Plastic Co., Fort Worth, Texas. The cups are made on a battery of automatic injection molding machines (photo above) which degate the cups and drop them on a conveyor line which carries them to the packaging area. Six of the cups come packed in a printed polyethylene envelope labeled, "All Plastic Disposable Picnic Cups for hot or cold drinks. Six 9-oz. plastic cups. Serve hot drinks at drinking temperatures." These cups, available in several pastel hues, retail at 19¢ per package, or 3¢ each. Their design features include a reinforced section at the base, a reinforced lip, and three small lugs on the bottom which provide an air space beneath the cups, preventing heat transfer to surfaces on which they are placed. The economy of this cup is made possible by a rapid molding cycle and minimum use of material. Wall section is approximately 0.02 in. or less.

These cups, in the 7¼-oz. size, were first introduced for use in automatic hot- and cold-drink vending machines, and the company is currently producing at a rate of 100 million per year. Some idea of the market potential can be gained from the fact that in 1955 there were 63,400 cold-drink vending machines in the United States and 60,100 hot-drink vending machines. About one billion paper cups were used in the former group; around three-quarters of a billion were used in the hot-drink machines. Estimates are that well over two billion cups of all kinds were used in drink vending machines in 1956.

Also in production is a disposable cup for

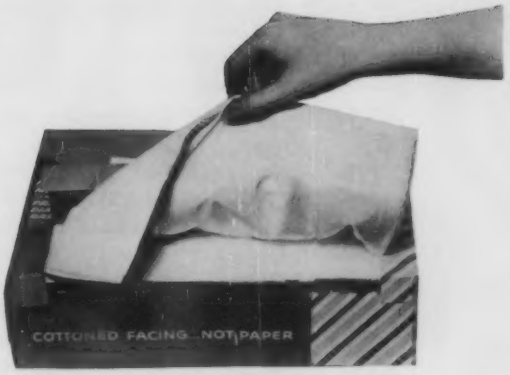
Baby feels comfortable in one-use diaper made of non-woven fabric, cellulose pulp, and polyethylene. (Photo, Bakelite Co.)

vending machine use by Continental Can under its Bondware trademark. According to unofficial information, these cups, which are thermoformed from impact styrene sheet material in a "natural" color, are produced in a Chicago plant on a Brown plastics forming machine. They have a reinforced, turned lip. Four "dimples" formed in the base serve the same function as the three lugs on the Crown cups. The Bondware cups cost $12.80 per thousand in bulk quantities.

While up to the present there has been an inclination on the part of some automatic drink machine patrons to carry away plastics disposable cups rather than to chuck them in the trashcan as they did paper cups, the manufacturers of the plastics cups believe that it is only a matter of time until the public accepts the plastics cups as more convenient containers that are completely discardable.

With the growing popularity of frozen dairy desserts, companies such as Tastee-Freez, with hundreds of roadside stands throughout the country, have become large-volume users of expendable sundae and banana split dishes (photo p. 94) vacuum formed from impact styrene alloy sheet material. Federal Tool is one of the major producers of these dishes. These colorful dishes not only lend merchandising impact to the product, which is usually consumed in cars right at the stand, but unlike some types of paper plates they cannot become soggy or impart a foreign taste to it. They are usually used with molded styrene spoons. One major frozen dessert chain alone is reported to have used approximately 15 million of these sheet-formed sundae dishes in 1956.

During the forthcoming season, this company will introduce a new type of take-home sundae dish, vacuum formed from impact styrene sheet stock and having a transparent plastics cover.



Laminate of polyethylene film and cottoned facing makes convenient throw-away baby diaper. (Photo, The Visking Corp.)

Shelf trim, produced by continuous die-stamping of extruded acetate, retails at 10¢ per yard, sufficiently inexpensive to encourage periodic replacement by the housewife. (Photo, Superior Plastics)

Waterproof disposable household mitts, made of 1½-mil polyethylene, retail at 10¢ a pair. (Photo, Central State Paper & Bag)

Physician's single-use examining glove made from vinyl plastisol is popular disposable in medical field

Polyethylene film storm window is low in cost. (Photo, Central State Paper & Bag)

Experience indicates that even though the plastics sundae dishes are somewhat more costly than paper, they greatly increase the merchandising appeal of the product and, in many instances, are taken home by patrons for further, if temporary, use.

Thermoforming has also simplified one of the problems of the commercial artist, who must mix colors frequently and does not wish to lose time washing out the usual types of mixing cups, which are too costly to discard. Regush Products Co., New York, N. Y., has met this situation with disposable plastics mixing cups vacuum formed from Styron 475 impact styrene sheet material 0.005 in. thick. The cups (photo p. 94), 1⅝ in. in diameter, are for work with water colors, tempera, retouch colors, inks, and dyes. Completely disposable, the cups are used with a permanent aluminum tray which holds five of them. Partially used paints can be stored in the cups for future use. The surface of the plastics cups takes pencil and ink marking for job or color identification. Refills for Mix-Eez cups are sold in a package containing 50 cups and retailing at 79 cents.

Inverse proportion to cost

Film table covers, whether polyethylene or vinyl—generally, but not necessarily, to be placed over regular tablecloths—are essentially disposable in the thinner gages, and their expendability is in inverse proportion to their price. Vinyl and polyethylene drapes, which fall between paper and cloth in the cost scale, are also relatively disposable, their low cost making for customer satisfaction with a short product life.

With lower-cost polyethylene and with the development of rapid methods of extrusion-coating paper with that resin, has come a new market in completely disposable or one-use products made from this material. One example is in "bibs" for lobster eaters. The polyethylene surface is next to the clothing of the user and the paper faces the lobster so that stains may be absorbed. Such a product is produced by Royal Paper Products, Coatesville, Pa. A more or less similar item is the throw-away diaper (photo page opposite) by Blessings Inc., New York, N. Y. This is a combination of non-woven fabric, fluffed cellulose pulp, and polyethylene. It is $\frac{1}{10}$ the weight of the lightest cloth diaper, has strength, water and chemical resistance, and folds up so compactly that a day's supply will fit in a handbag.

Chix Baby Products, Div. of Chicopee Mills,

New York, N. Y., is producing Chux disposable diapers (photo p. 96) from a laminate of Visqueen film and cottoned facing.

For periodic disposability, a large outlet for sheet plastics is in shelf linings and edgings. Vinyl film, cellulose acetate, and oriented styrene sheet are all used for this purpose, and some polyethylene-coated paper is also offered. Some of the edgings have adhesive on the back. Superior Plastics, Chicago, Ill., produces a line of acetate decorative shelf trim (photo p. 96) to retail at 10¢ a yard, which permits the housewife to discard it every once in a while and buy a new color.

Similarly, a new market for vinyl film has opened up in the low-cost and therefore relatively disposable self-sticking decorative vinyl films such as ConTact, Stix, Decor-Eze. Decorative cut-outs, film blackboards, and similar items are being made from these materials.

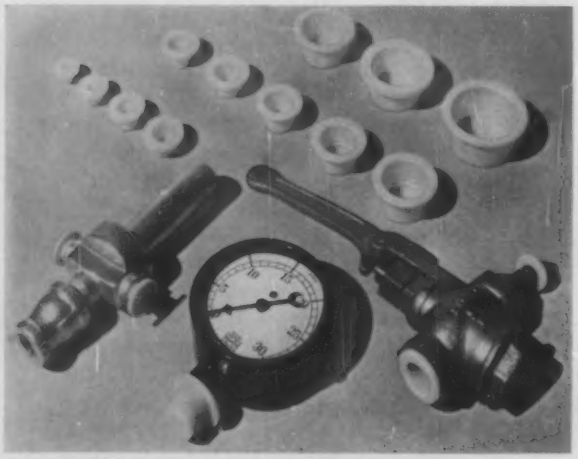
Storm window kit contains sufficient polyethylene film to cover seven windows, retails for only $2.98. (Photo, Kordite Co.)

Film offers opportunities

The manufacturers of disposable merchandise are looking to plastics films for many new opportunities. A disposable washing mitt (photo p. 97) fabricated from 1½-mil polyethylene film is offered by Central States Paper and Bag Co., St. Louis, Mo., at a retail price of 10 mitts for $1. They are useful for painting, gardening, and other household chores. In the medical field is a disposable physician's examining glove (photo p. 97) developed by Galen Enterprises Inc., Spokane, Wash. This glove, in a non-toxic vinyl material, will be in mass production shortly and it is estimated that the potential market could be as high as two million gloves per day.

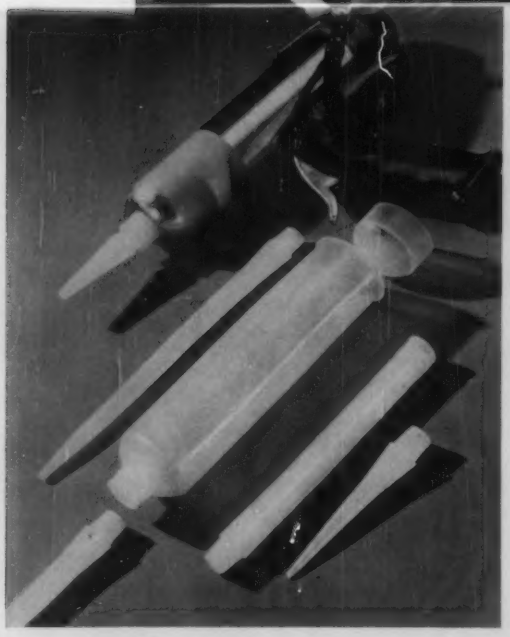
Little need be said about film drop cloths and furniture covers. They are, like other products, semi-disposable and, particularly in thin-gage polyethylene, are low in cost.

The storm window kits merit mention, especially since it is now possible to secure relatively transparent polyethylene film; the windows are made of polyethylene, cast vinyl, and



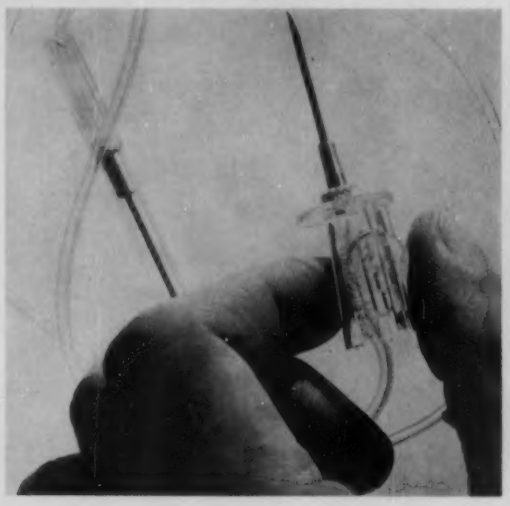
Caps molded of polyethylene provide low-cost protection to threaded parts during assembly, shipment, handling. (Photo, Eastman Chemical Products, Inc.)

In unusual application, entire house is wrapped in 0.002-in. polyethylene film for temporary insulation. (Photo, Bakelite Co.)



Cartridges and nozzles of sealant gun can be discarded after use, eliminating cleaning operations. (Photo, Eastman Chemical)

Blood donor set—disposable—is molded of styrene, incorporates flow regulator for accurate control. (Photo, Koppers Co., Inc.)



One-shot enema, consisting of 4-oz. solution in vinyl bag, saves time and expense in hospitals, is also of interest at retail level as consumer item. (Photo, American Hospital Supply Co.)

even calendered vinyl. Central States Paper and Bag. Co. offers a kit (photo p. 97) for the do-it-yourself market, which will cover a window 36 by 72 in. at a cost of 39¢, including framing strips and nails. The same company is introducing its Pro-Tex-Mor film in 100-ft. rolls, 54 in. wide, folded to 27 inches. This will be featured as storm window material but it can be draped, sealed, taped, or stapled for use as insulation barrier, hot-house or cold-frame covering, and a host of other applications.

Another storm window kit (photo p. 98) produced by Kordite Co., Macedon, N. Y., offers sufficient film for seven windows at a retail price of $2.98. The Kordite window material is extruded with a reinforced edge which serves as "built-in" framing.

One of the most oustanding examples of the durability and then the disposability of polyethylene film was the case of an old farmhouse (photo p. 98) near the campus of the Purdue University Agricultural Experiment Station which totally lacked insulation. A 16-ft.-wide, 100-ft. strip of 0.002-in. polyethylene film was wrapped around the house just below the eaves and an 8-ft.-wide strip was then wrapped around the bottom, with light lath battens nailed at intervals to hold the film in place. Openings were cut around doors and some windows where ventilation was essential. The occupants of the house were warm through the winter.

Industrial disposables

Industry is using disposable plastics on an ever-increasing scale. In combatting the high cost of labor and materials, disposable units, composed partially or entirely of plastics, can often play an important part.

Molded polyethylene caps (photo p. 98) provide effective, low-cost protection for threaded parts against dust, dirt, and damage. Produced by Clover Industries, Inc., Tonawanda, N. Y., they serve either as caps for extruded threads in a machined part or as plugs to protect external threads during assembly, shipment, or storage, Made in green or yellow, the polyethylene caps are manu- (*To page* 206)

Thermoformed scenery for TV

World's largest vacuum forming machine, installed in NBC studio, uses world's widest rigid vinyl sheet

The plastics industry, no doddering veteran itself, is moving in on one of America's youngest and richest babies—television. Lightweight plastic sheet is now being used to turn out, at low cost, vacuum formed three-dimensional TV scenic elements that are realistic, photogenic, and easy to make, handle, and store. Moreover, the new operation is flexible and fast-moving, to carry out the special demands of exacting scenic designers and to meet the ever-recurring deadlines that harass program directors.

The first full-scale plastics-television combine is to be found in the Brooklyn, N.Y., studio of the National Broadcasting Co. Here the widest available sheets of rigid vinyl are clamped in a huge vacuum forming machine and quickly transformed into many types of background scenery.

The imposing 16-ft. columns seen on television in the "War and Peace" and "Mayerling" spectaculars, the solid-looking, rough-hewn mountain cabin and the trim airplane interior used recently in a Kraft show, as well as dozens of other props, were designed and formed here of vinyl sheet. Rough and formal fieldstone, brick walls, pilasters, rows of books, pedestals, archways, shingles, weathered boards—these and many more are turned out regularly, used in a particular setting, then stored for another day or destroyed to make space for new items.

This new NBC operation is a great improvement over former methods of making scenery.

Airplane interior (left) for Kraft show was fabricated in 13 sections from vacuum formed vinyl sheet (Photos, NBC)

These often consisted of constructing a number of heavy, expensive objects or of painting a design on a flat surface—as of a brick wall—which in close-up revealed its lack of an actual third dimension. With vacuum forming, one original scenic element is made by carpenters or scenic artists and used as a mold by which to reproduce any number of other elements.

Take, for example, the airplane interior in which everything was plastics but the seats. This was actually put together in 13 sections, all vacuum-formed from a single mold. Carpenters in the NBC workshop constructed from wood and canvas, with burlap stretched over part of the surface to give texture, a mold about 10 ft. long, 4 ft. wide, and 5 in. deep. Apertures were left to simulate windows and provision was made to reproduce pushbuttons to call the stewardess, switches for lights, and dials to turn in changing air. Even the ventilating louvres with overlapping slats were all finely detailed.

The mold was then placed on the machine, the vinyl sheet inserted, heated, let down, and clamped, and the resultant form became one of the 13 sections. The upper end of each section was bent to form the curved wall of the plane. The 15-mil vinyl sheet used in this and other jobs has to be supported and braced with wood; when heavier material is available, the plastic form will keep its shape with little if any support. Handpainting is done after forming, first with a solid priming coat, then with a casein-based paint. Trimming of the light material is done with nothing more elaborate than long-handled shears.

How column mold was made

In making the ornamented, fluted columns for ballroom scenes in NBC spectaculars, a wooden half column was constructed and split lengthwise. With the flat side downward, these two pieces served as a mold to vacuum form 36 half-columns which were joined to make

Operators remove formed vinyl column half from forming machine. Halves are joined and mounted on pedestal to make realistic prop

Formed column, weighing 15 lb., is easily carried by one person. Old-style columns weigh 150 lb., required four stagehands

18 complete ones. The columns, 18 in. in diameter but weighing only 15 lb. each, were placed on 3-ft. pedestals that had vacuum-formed ornaments on their front faces.

Brick walls are formed on sand-cast female aluminum molds; a section 1 ft. wide is repeated 36 times to make a good-sized wall. "Our plastic bricks look more real on TV than real bricks," says scenic designer Ted Cooper, who had a big part in setting up the operation. "We emphasize the depth of the grooves so that the whole job won't look like a flat painted wall under studio lighting. If we want to make the vacuum-formed bricks appear old and chipped we simply apply little chunks of aluminum-filled plastic in the corner of the molds."

Brick wall, vacuum formed on sand-cast aluminum molds, looks more realistic on the screen than a wall made of actual bricks

A fieldstone wall is put together in sections made from a 10 ft. by 5 ft., 9 in. mold constructed of foamed styrene and plaster; another mold turns out natural-looking corners which end-match either side of the flat sheet.

Vacuum-forming a row of plastic books is simple but ingenious. Half a dozen real books are sawed diagonally from corner to corner. The long right-angled block which results is used as a mold. The backs of the books, complete with titles, show in the completed job.

Reduced cost important

The reduced cost in producing scenery is an important item in the plastics operation. "If we had been obliged to buy the columns used in our 'War and Peace' opera," says Herb Lager, director of the NBC workshop, "they would have cost $250 each—and we would have done without them. The plastic columns cost us $40 each. Fieldstone wall sections, 8 by 4 ft. maximum, made of rubber sheet or other material, would have cost $50; now we can make a 12 by 6 ft. piece for only $20. Added to that, of course, are the advantages of easy handling, and no delay in ordering from the outside. Also, the designer can order and get what he wants; he doesn't have to 'make do' with undesirable materials and methods. The machine operation has opened new fields with possibilities that are unlimited."

The machine in use in NBC's studio is the world's largest vacuum-forming unit. It measures 22 by 17 by 9½ ft. and has a forming area of 12 ft. long by 6 ft. wide. It was engineered and built to NBC specifications. Parts can be formed up to 14 in. in height or depth, and fine work can be handled as well as heavy; put a piece of lace over a mold, or coins, razor blades, a pencil, a needle and thread, and every detail, even the thread, will be precisely and realistically reproduced.

"For economical use of material," explains Mr. Cooper, "The machine's clamp frame is adjustable, at present up to three widths—5 ft. 9 in., 3 ft. 10 in., and 1 ft., 11 in." The spacer bars for these widths can be moved any distance apart up to a maximum of 12½ ft. For simplification, we have constructed our mold bases in sizes that give us, in the three widths, any length from 1 to 12½ ft. in 6-in. increments."

When forming a small piece, the entire machine does not have to operate. "The heating elements are divided into three sections," says Mr. Lager. A switch turns on each section independently, and each section is controlled by a separate pyrometer. In addition, each of these sections is further divided in half, front and back. Only the heat in the needed section is turned on. Also, the vacuum can be applied in sections."

Although any thermoplastic sheet can be used in the vacuum-forming machine, NBC chose vinyl for its initial operations because it forms well and is fairly economical. The material first ordered was 15 mils thick and 75 in. wide. "These sheets," says Mr. Cooper, "are not heavy enough, in most applications, so we have ordered 20-mil, 30-mil, 40-mil and 60-mil sheets. The heaviest sheets will be used in large self-supporting forms, the 20- and 30-mil for

Production of vinyl "fieldstone" wall starts with a sheet of vinyl, about 12 ft. long and 75 in. wide, placed in frame of vacuum forming machine claimed to be world's largest

smaller self-supporting forms, as books, ornaments, etc., and the lighter sheets for large textured surfaces to be attached to walls or put on a supporting frame."

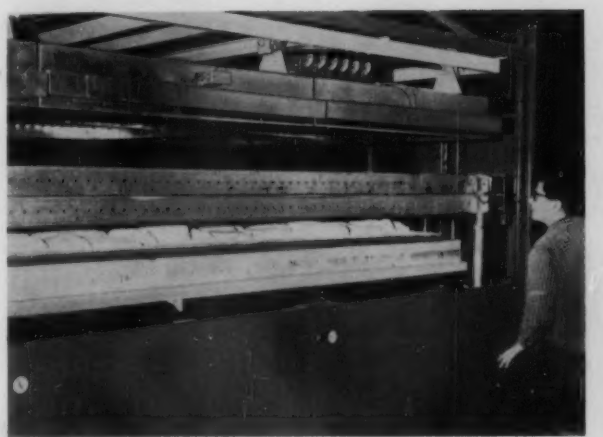
In many cases undercuts can be tolerated in a mold. "Factors to be considered," notes Mr. Cooper, "are the over-all size of mold and depth of draw, as well as position and shape of undercut. Weight and type of plastic used are also important. One method of mold-making which permits undercuts is to rig molds so that they collapse after forming the sheet."

How it started

The present operation started some time ago when Mr. Cooper saw an advertisement in *Modern Plastics Encyclopedia* of a "small laboratory machine under $1000." He investigated thoroughly and, in 1956, NBC had several vacuum forming jobs done, including capitals for columns in "Cradle Song" and giant leaves in "Jack and the Beanstalk."

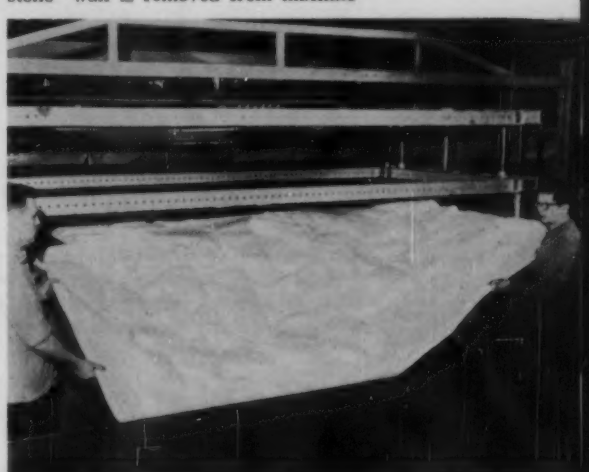
So successful were these scenic props that it was recommended NBC purchase a vacuum forming machine and do its own sheet forming. The recommendation brought an unusual reply from the NBC top-level: "Get the biggest machine you want!" And that's the vacuum forming machine—at present the world's largest—that is today turning out props in the Brooklyn studio.

Credits: Vinyl sheet, 15 mil, from Monsanto Chemical Co., heavier gages from Nixon Nitration. Machine from VacForm Plastic Forming Machinery, Emhart Mfg. Co.



After sheet has been properly heated, it is draped over foamed styrene-and-plaster mold; then vacuum is applied

At end of cycle, formed section for "fieldstone" wall is removed from machine



See-through

Although plastic components have been used in the past in the construction of professional-type hair dryers, the new Holiday model dryer made by Helene Curtis Industries, Chicago, Ill., is believed to mark a new concept in the use of plastics for this type of appliance.

In the construction of this new dryer, molded plastics were selected for four basic parts of the unit—three of acrylic and one of heat-resistant styrene. In addition, the dryer has nylon guides for the tubular metal supporting shaft so that it can be adjusted smoothly up or down in the exterior column in which it is held. While contributing to the modern appearance and quiet, efficient operation of the dryer, the plastics parts also helped to keep manufacturing costs in line and permitted one-shot molding of some components of other materials difficult or costly to fabricate.

Features of the new dryer which appeal to beauticians and their patrons are its wide range of available colors, quiet operation, fast drying, and automatic functioning. Patrons, in particular, are enthusiastic about the transparent

Cut-away view of dryer, showing relative locations of outer hood, air diffuser with 12 molded-in vanes, and molded styrene fan (just above screen in circular heater)

hair dryer

Three plastics contribute to appearance and efficient operation of appliance and keep costs in line

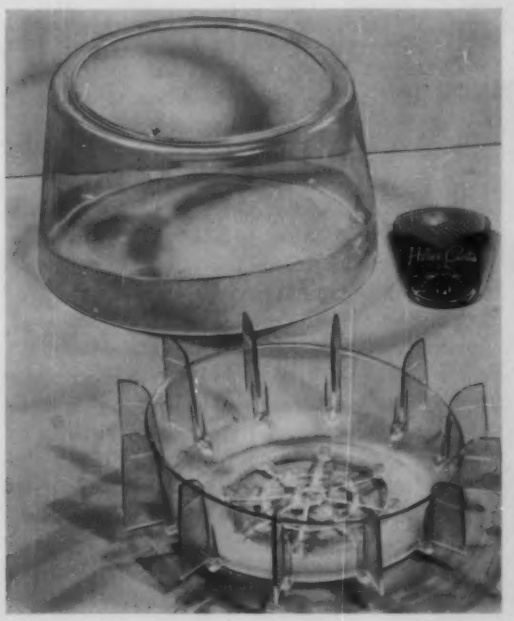
acrylic hood of the dryer, which frees them from the "claustrophobic" confinement of the customary opaque hood.

32-oz. acrylic part

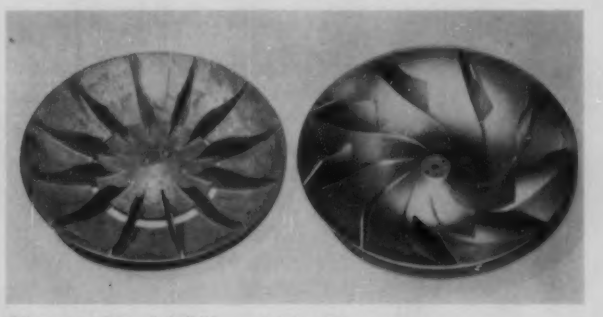
The hood portion, weighing approximately 32 oz. and having a maximum diameter of about 14 in., is the largest and heaviest of the three injection molded acrylic parts. Other acrylic parts include the air distributor, or inner hood, and the decorative name plate, which also incorporates calibrations for the adjustable temperature settings. The hood is used in conjunction with a drawn sheet steel housing containing the motor, the molded styrene fan, the electrical heating element, and other operating parts.

The transparent acrylic hood, which withstands the operating temperatures of the dryer without distortion, is produced in a single cavity mold on a 48-oz. injection machine. The mold has a central sprue and four wide, flat gates around the inwardly curving bottom edge of the part to promote rapid and complete filling out and eliminate objectionable weld lines and bubbles. After removal from the mold, the gates are routed off and the 12 mounting holes around the top edge are drilled two at a time by the press operator, using a multiple drilling fixture. The parts are also annealed for approximately eight hours in an oven at a temperature of 170 to 180° F. to relieve internal strains.

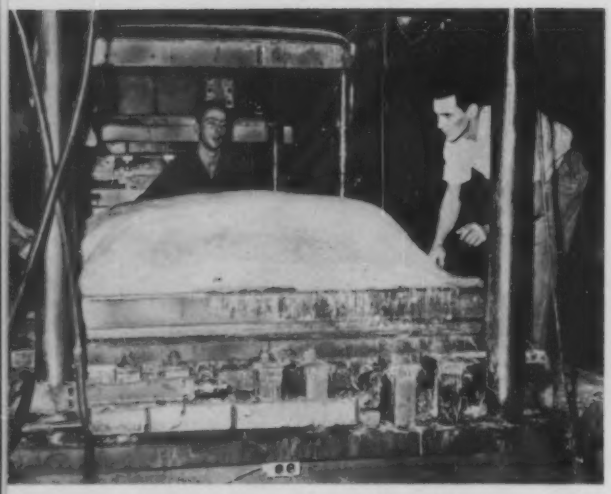
Next of the acrylic parts in size and weight is the inner hood or air distributor. This component, with a central grille at the top and a series of 12 vanes equally spaced around the outer edge, is produced in a single cavity mold on a 24-oz. injection machine. It is molded with a heavy central sprue and a 0.090 in. thick fan gate in the middle of the unit, which is milled out as part of the finishing operation. Bosses molded into the base of the radial vanes are also drilled after molding to provide attachment holes for the bolts which hold this piece in position within the outer hood. Eight bosses spaced around the circumference of the central grille portion are cored in the mold; bolts passing through these holes secure a (*To page* 210)



Molded acrylic parts include outer hood (top), air diffuser (bottom) and decorative nameplate. (Photos, G. Felsenthal & Sons)



Styrene fan (right), weighing 10 oz., replaces 13-oz. cast magnesium part; it works more quietly and costs less



Veil overlay for smoother finish is placed on preform for Thunderbird hardtop, in position for molding on 300-ton press

Finishing operations on skin and inside rails of molded hardtop. (Photos, Plastics Div., The General Tire & Rubber Co.)

4 new car parts

A trend toward increased use of reinforced plastics in body components is pointed up by these new applications

While the concept of the all-plastics car or truck body has been getting all the publicity and most of the attention in the automotive industry, reinforced plastics component parts have been moving quietly but steadily into a prominent position in the field. Four such new applications have cropped up in 1957 cars and trucks: a smartly designed hardtop for the sleek Ford Thunderbird, a hood overlay for Studebaker's 1957 version of the Golden Hawk sports car, and grilles for International Harvester Co. and Studebaker-Packard trucks. In all four instances, the light weight, durability, rust and corrosion resistance, and the economical tooling costs associated with the use of reinforced plastics dictated the choice of the material, but each of the applications also represents significant achievements in styling and production made to meet a number of specific end-use requirements.

Ford's reinforced plastics hardtop for the Thunderbird is supplied as an optional accessory that can be mounted on the body of the car in a matter of minutes when weather is threatening, or just as easily removed for pleasant summer driving.

The one-piece hardtops are made for Ford by Reinforced Plastics Div., The General Tire & Rubber Co., Marion, Ind. As the first step in the operation, preforms are made by spraying chopped fibrous glass rovings onto a large preform screen mounted on a vertical turntable in a plenum chamber. The fibers are drawn by vacuum onto the screen and are held in place by the resin binder which is also sprayed onto the rotating preform. When the preform attains the required thickness, a metal door closes the plenum chamber, converting it into a curing oven. Gas-fired heat, driven by a circulating fan, is directed into the chamber to cure the resin binder.

The finished preform, weighing 6½ lb., is

then removed from the chamber and positioned on the male half of the matched metal die in which the top is to be molded. A veil mat overlay is placed on the top of the preform to give the exterior a smoother finish and improved weather resistance. The press used in molding the top is of 300-ton capacity, with a 72- by 84-in. platen area, 48-in. stroke, and 84 in. of daylight. A measured quantity of polyester resin is poured over the preform through a strainer and spread by hand to insure proper distribution and impregnation. The press is then closed and the part cured. After removal from the mold, the part's edges are trimmed with a grinder.

The molded top is reinforced by a series of rails which run around the margin on the top of its inner surface. These rails, composed of 11 closely fitting sections, are compression molded in matched metal dies, using fibrous glass-polyester resin premix material. Also molded of premix materials are the frame for the rear window opening and the frames for optional "porthole" side windows.

The molded rails and window frames are bonded to the inner surface of the hardtop with an epoxy-based cement. No metal fastenings are used. For this operation, special cementing fixtures, including C-clamps and toggle clamps, are used to hold the parts in position until the cement has set. Heat lamps accelerate the curing process.

On those hardtops which are to have "porthole" windows, openings are cut through the molded polyester-glass laminate with a router, using a templet to make certain that the win-

Last finishing step at the molder's plant is to sand smooth the outside surfaces of top. Priming and painting will be done by the automobile manufacturer. (Photo, Plastics Div., The General Tire & Rubber Co.)

Finished reinforced plastics top, lightweight yet sturdy, is lifted into position on Thunderbird body. Tops are painted in various colors. (Photo, Ford Motor Co.)

Reinforced plastics hood overlay for Golden Hawk provides additional space required for supercharger, eliminates necessity for special hood die. (Photo, Plastics Div., The General Tire & Rubber Co.)

Modern styling, sturdy construction, and conformity to over-all design of the vehicle are evident in reinforced plastics grille on Studebaker truck at left

Grille used on International Harvester truck, also molded of reinforced plastics, has molded-in vertical and horizontal struts

dows are accurately located and properly sized. Final finishing operations consist of removing excess adhesive from the cemented joints and sanding the tops to a smooth finish, ready for priming and painting. Total weight of the hardtop at this point is 37 pounds. The tops are then examined on a special master checking fixture to make certain they meet dimensional tolerances before being shipped to Ford for final finishing.

At the Ford plant, the tops are primed and painted. Rear window and quarter window panels are fitted into place and the six metal latches which secure the top to the Thunderbird body are installed. Also installed at the Ford plant are the roof insulation, the perforated vinyl headlining, and the rubber gaskets and chrome trim around the windows and outside edges of the hardtop.

Hood overlay

The reinforced plastics hood overlay used by Studebaker-Packard extends most of the length of the hood and is designed to provide sufficient headspace for the supercharger in the company's Golden Hawk models. By thus combining the reinforced plastics overlay with the regular sheet steel hood stamping, (*To page* 209)

Luxury look in rigid vinyl

Jewelry counter display case is economically produced by pressure forming and electronic bonding

Display box pressure formed of heat-resistant modified rigid vinyl provides luxury setting for showing off line of jewelry

Second major appearance for pressure-formed rigid vinyl sheeting in the display box field (see "Styled for strength," MODERN PLASTICS *33*, 107, Dec. 1955) is a new contoured counter display unit being used by Speidel Corp., Providence, R. I., for its line of men's jewelry. Both the base and lid of the display box are of "sandwich" construction in which the two outside layers are formed of 25-gage heat-resistant modified vinyl sheeting and the "core" is a flat sheet of 100-point cardboard to serve as a stiffener. The vinyl layers are electronically bonded around their periphery.

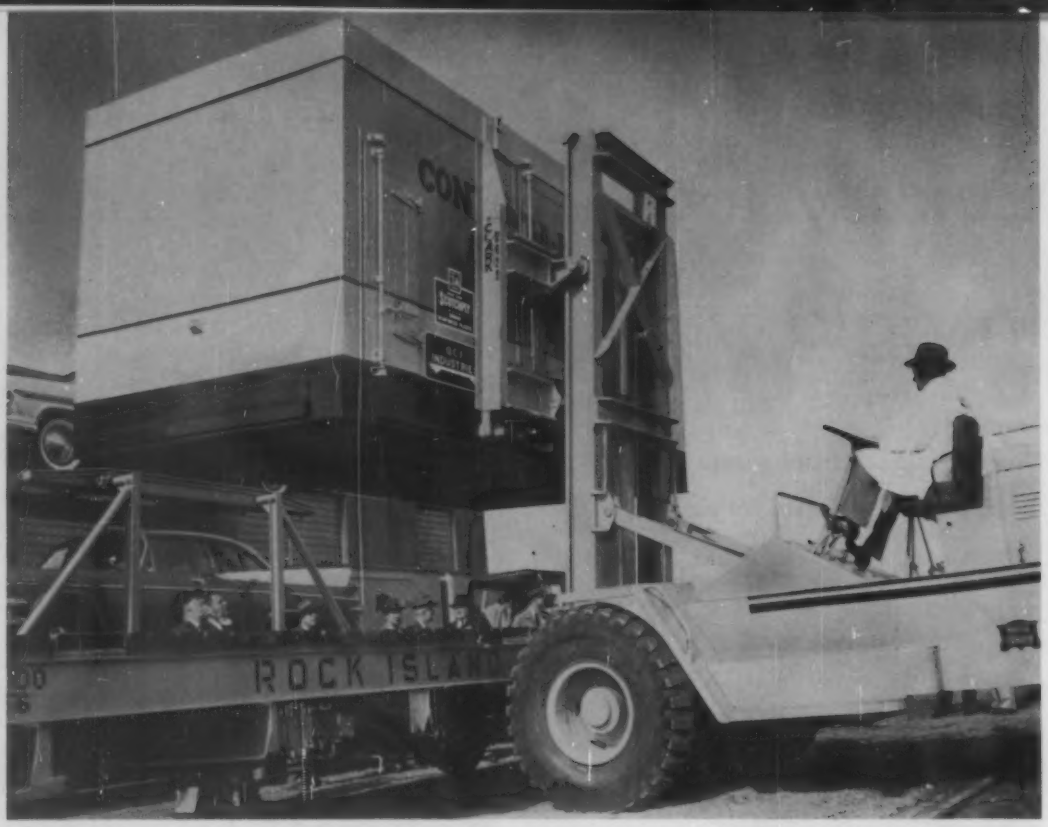
According to the manufacturers, this type of construction made it economically possible to incorporate in a single unit the appearance of a luxury package, the functional advantages of contoured recesses to hold the jewelry snugly in place, and the practicality of having a tough vinyl exterior that is long-wearing, lightweight, and easy to clean. The outside surfaces of both base and lid are formed in a realistic rich alligator grain pattern that has the "luxury" feel associated with the merchandising of jewelry.

Six compartments, each of which holds a different set of jewelry, are formed into the tray-like base; a single deep recess in the inside of the lid accommodates a seventh set.

Credits: Constructed and manufactured by Plaxall, Inc., Long Island City, N. Y., for Speidel Corp., Providence, R. I., using vinyl sheet supplied by Nixon Nitration Works, Nixon, N. J., and based on Geon resin supplied by B. F. Goodrich Chemical Co. Styling by Richard Arbib Co., New York, N. Y.

Cross-section of box shows "sandwich" construction used. Outside layers are formed of vinyl; "core" is flat cardboard sheet

Outside of case is formed in alligator grain pattern. Raised trademark panel is also formed into sheet, then gold-stamped



Reinforced plastics cargo unit, approximately 17 by 8 by 8 ft. in size is lifted from special flatcar, to which it was securely anchored in transit by automatic locking device. (Photos, Rock Island Lines)

Newest cargo carrier

Only minutes later the unit is deposited onto a waiting flat-bed truck trailer for immediate delivery to ultimate destination. Doors in "crate" facilitate loading and unloading of cargo unit

Before a group of industrial, railroad, and military representatives assembled in Chicago recently, a huge fork lift truck snuggled up to a low-slung railroad flat car and lifted from it a 17-ft. reinforced plastics container holding 14,000 lb. of refrigerated meat. Backing away and turning smoothly, the truck then deposited the king-sized plastic unit on the bed of a waiting flat-bed truck, where it locked automatically in place, ready for prompt delivery to any point accessible by truck.

This was one of the highlights of a demonstration by Rock Island Lines to show what its president, D. B. Jenks, termed Rock Island's answer to the so-called "piggy-back" system of freight transport. Rather than follow this method, in which standard truck trailers are loaded on regular flatcars to facilitate shipment of merchandise, Rock Island has developed its own Convert-A-Frate service, based on a special flatcar used in conjunction with several types of interchangeable cargo carriers.

Among the modular units which fit the special flatcar—and also will fit standard truck bodies—are a hopper car, boxcar, gondola car, covered hopper car, two-level auto transport and a pallet for collapsible racks used in shipping various commodities. Of these units, the only one presently incorporating plastics is the refrigerator container for food products, which is being placed under test by Swift & Co. Marking a pioneer use of reinforced plastics in the construction of heavy-duty railroad equipment, the refrigerator type cargo carrier employs the "stressed skin" principle long familiar to the aircraft industry and now being used in the construction of refrigerated truck bodies.[1]

Advantages of sandwich panels

Rock Island officials point out that four basic advantages were gained by employing reinforced plastic sandwich panels in the new Convert-A-Frate refrigerator unit. These include lighter weight (an estimated reduction of 50% over construction methods); ease of assembly; exceptional insulating qualities and, finally, the fact that since adhesives bind the panels together, each compartment becomes a com-

[1]See "From jeeps to giants," MODERN PLASTICS, 34, 103 (Nov. 1956).

is a refrigerated box, made of reinforced plastics, designed to hold seven tons of meat

Cured sandwich for cargo carrier, after emerging from press, is lifted for stockpiling. Panel has balsa core, glass-epoxy skins. (Photos, 3M)

Sandwich panels, cut to size and with edges mitered, ready for assembly. Space around door opening is internally reinforced for added structural strength

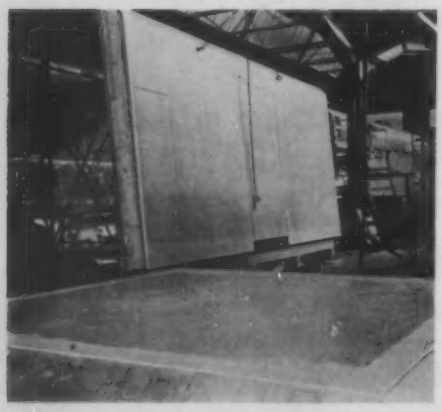
pletely sealed, impervious unit, forestalling the entrance of moisture with consequent deterioration of the insulation.

Overall dimensions of the refrigerator unit are 17 ft. long by 7 ft. 8 in. wide by 8 ft. high, giving the container a capacity of 686 cu. ft. Maximum load, including meat hung from overhead rails, is 25,000 pounds. Empty weight, including the welded steel frame on which it rests, is 6000 lb.; replacement with a reinforced plastic frame would further reduce the weight of the unit by several hundred pounds. For convenient loading and unloading, the container is designed with large double doors at one end and a single door centered on one side. Another smaller door provides access to the refrigeration equipment.

The single-section panel sides and roof of the refrigerated shipping container are made of 3¾-in. flat-grain balsa wood cores faced with a layer of 1-in. plywood on each side and finished off with external and internal skins comprised of a ⅛-in. layer of isotropic epoxy-impregnated fibrous glass reinforcing material. The floor is a 2¾-in. flat-grain balsa core surfaced on the top with plywood and a ¼-in. skin of the same type plastic laminate, with a ⅛-in. skin used on the bottom side. All joints are bonded with epoxy-base adhesive. Even the six 1¼-in.-diameter aluminum pipes mounted lengthwise in the top of the carrier for hanging sides of beef are secured to the inner side of the roof by reinforced plastic supports held in place by adhesive.

Adhesive bonding throughout, along with the inherent thermal non-conductivity of the reinforced plastics skins and core materials, helps to provide the shipping unit with a high degree of insulation, free of the "short circuits" that would be present if metal fastenings were used. Another advantage of bonding is that the box presents a continuous plastic surface without metallic protrusions, thus offering benefits in sanitation and ease of cleaning. The stressed skin construction method also produces a finished structure which, even without conventional framing, meets all railroad requirements for ability to withstand the roughest kind of shock and vibration involved in loading and unloading, switching, and humping operations. The reinforced plastic carrier is engineered to absorb a 10-gravity shock without damage—which would be the equivalent of running the unit into a solid wall at 10 miles per hour.

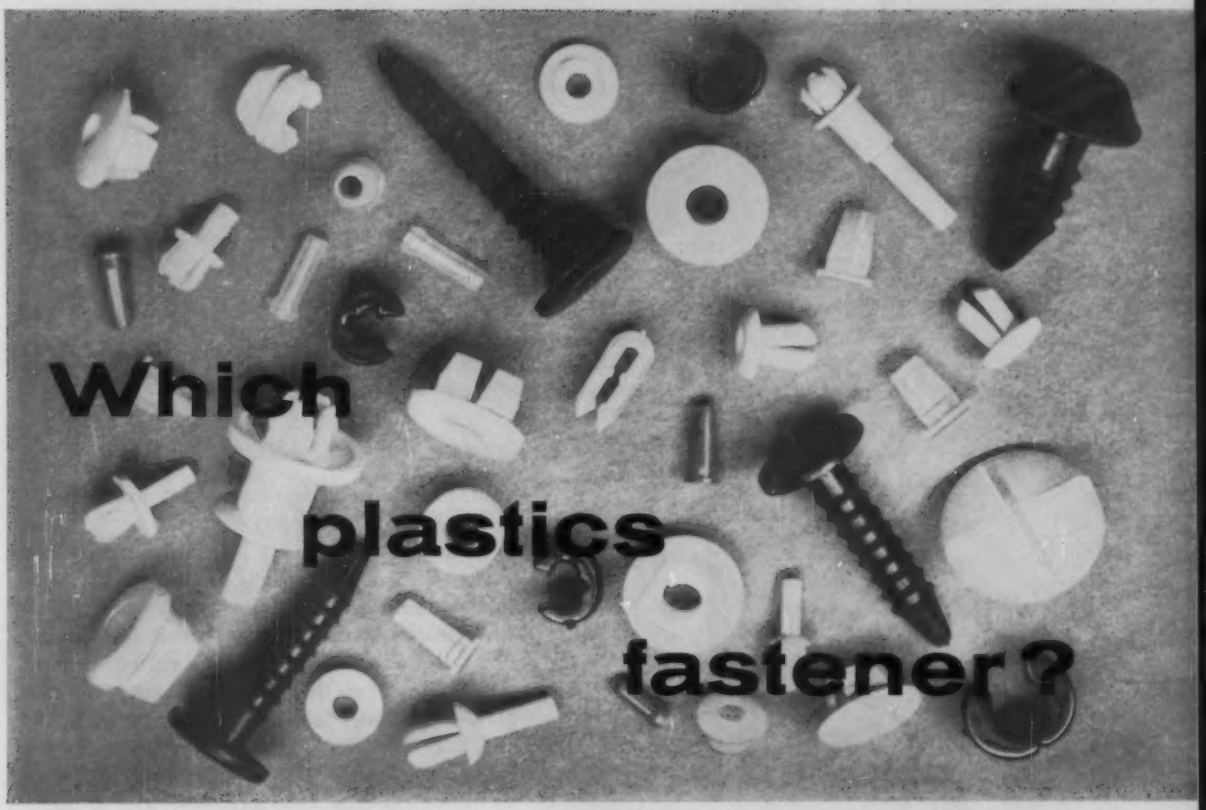
Assembly of the finished refrigerator unit was handled by the Rock Island Lines at its 49th St. shops in Chicago, using prefabricated sandwich panels supplied by Minnesota Mining & Mfg. Co., which cooperated in the development and engineering of the complete structure. The basic flatcar is built by ACF Industries, Inc. Built into the car is (*To page* 213)



Side panel of carrier is lifted into place in initial stage of assembly operation. Laminated construction of balsa wood core can be seen in foreground

Panels are bonded together with room-temperature-curing epoxy adhesive. The assembled sections are clamped together during this operation

Top section is lowered into place. Six lengths of aluminum pipe, from which meat will be hung, are supported by reinforced plastics brackets. (Photos, 3M)

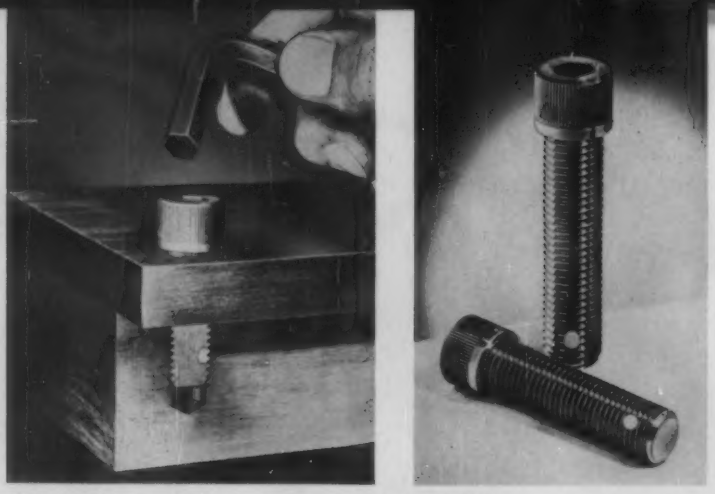


With scores of types and hundreds of sizes available, design engineers today can specify the exact assembly device for any application

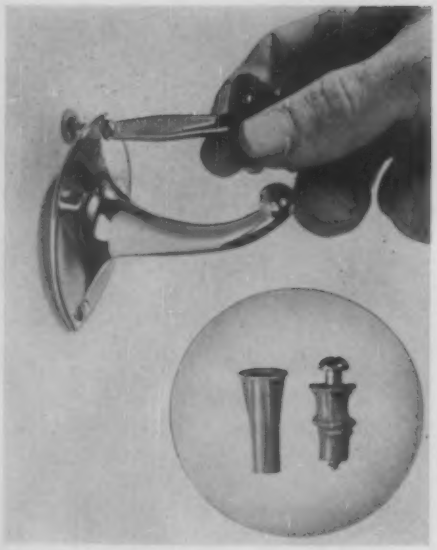
Millions of fastening devices made of plastics, now being used daily on the nation's assembly lines, are saving time and money, conserving manpower, and helping to overcome a variety of production problems which would be difficult if not impossible to solve with other types of fasteners. In this continuing campaign, a properly selected plastic fastener often proves to be the key to increased efficiency. In addition, small sub-assemblies can often be eliminated in favor of larger, more economically handled assemblies. In one case cited by a producer of plastics fastening devices, in which previous stainless steel and plastics components for a refrigerator shelf support were replaced by an all-plastic unit incorporating the plastic rivet principle, savings were reported to have run as high as 30% in total cost of purchased parts and assembly.

By combining desirable mechanical, electrical, and corrosion-resistant properties, a plastic fastener may often eliminate two or more non-plastic units that would be required to accomplish the same result.

The growing popularity of plastics fastening devices stems directly from their broad range of properties. Their toughness and flexibility, for example, permit their adaptation to a wide variety of fastening problems where mechanical strength and the ability to be stretched, squeezed, or pounded into final position are important requisites. Their excellent thermal and electrical insulating qualities are "plus" values in many applications, along with the fact



Nylon pellet in threaded portion of screw (right) is compressed between threads during installation (left), eliminates need for lock washers. (Photos, Standard Pressed Steel)



Butyrate expansion anchors hold screws fast in plasterboard, brick, etc. (Photo, Eastman Chemical)

that, unlike metal fasteners, they are not subject to rust or corrosion.

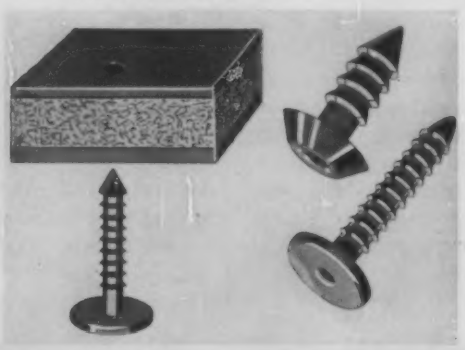
From the standpoint of the user, another highly desirable property of plastics fasteners is that their integral color can be matched or harmonized with that of a given installation, and will not wear off as might a surface coating. This eliminates the need for expensive and time-consuming "camouflaging" operations by the manufacturer. Also, plastics fasteners can be applied without danger of damaging painted or porcelain-enameled surfaces; this is particularly important in such products as stoves, washing machines, refrigerators, and many other appliances. Plastics fasteners also seal well because the resilient material yields slightly when brought into firm contact with minor surface imperfections.

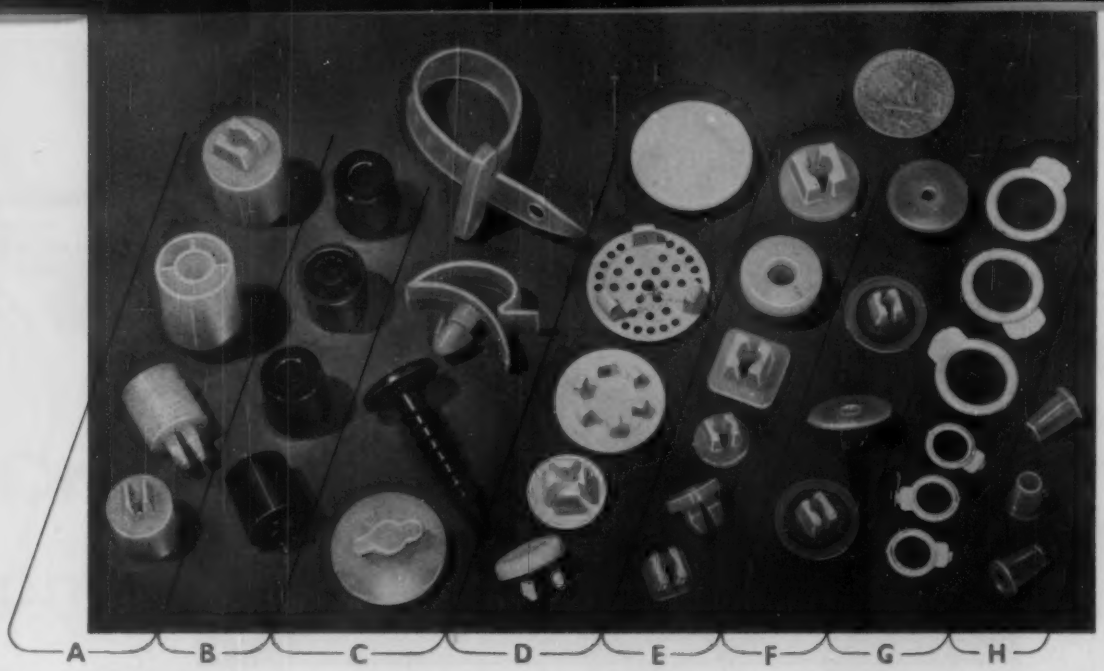
Materials used

Thanks to its exceptional toughness and other desirable properties, nylon has emerged as the plastic most widely used in fastening devices. Production techniques include fabrication from

Self-insulating clamp for holding wires, cable, etc., is molded of nylon. (Photo, Shakeproof Div.)

Headed push-in type polyethylene fasteners, used for installing firewalls in cars. (Photo, Shakeproof Div.)



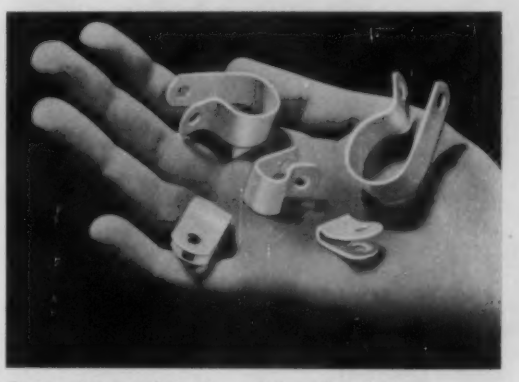


Assortment of plastics fastening devices: A—Plasti-Grommets; B—fasteners with expanding dimple in bases; C (top to bottom)—polyethylene electrical cable strap, nylon snap-in cable clip, polyethylene headed push-in type fastener (see bottom photos on facing page), quick-release nylon fastener; D—Plasti-Plugs with lugs that snap into openings for attachment; E—more Plasti-Grommets; F—Plasti-Grommets with flowed-in sealing gaskets; G—elastomeric vinyl Plasti-Rings for shaft retainers; H—name plate fasteners. Quarter at top is for size comparison. (Photo, Fastex Div., Illinois Tool Works)

nylon rod stock on automatic screw machine equipment and injection molding in multi-cavity molds. Other plastics finding extensive application in fastening devices include polyethylene, high-impact styrene, elastomeric vinyl, Teflon, and fibrous glass-polyester laminates.

Some of the plastics fastening devices now in use are basically counterparts of metal fasteners, such as nuts, bolts, and screws. These also provide electrical insulation between parts joined and are immune to rust and corrosion. In addition, there are now many specialized types of fasteners available in plastics developed to meet specific assembly problems.

One of the major suppliers of plastics fasteners fabricated from rod stock is the Nylo-Fast Div., Anti-Corrosive Metal Products Co., Inc., Castleton-on-Hudson, N. Y. Included in the line of more than 200 stock items are such products as hex nuts, washers, bolts, and machine screws in a variety of types and sizes. Most of these items are fabricated from Zytel 101 nylon rod stock supplied by The Polymer Corp., Reading, Pa. Several other plastics materials, including PVC and Teflon are used for special applications. This company points out that when nylon is used, its resiliency permits an "interference fit" which prevents loosening under vibration. Temperatures as high as 250° F., it is reported,



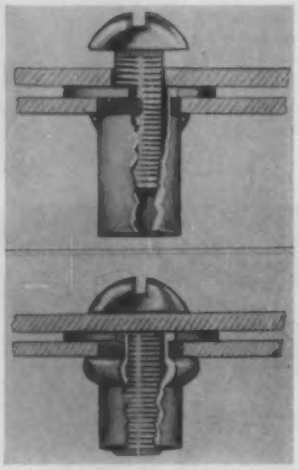
Corrosion-resistant reinforced plastics cable clamps for applications involving shock and vibration. (Photo, Lunn Laminates, Inc.)

will not affect the Nylo-Fast parts. Where color coding is desirable, the natural nylon parts can be dyed.

Weight is important

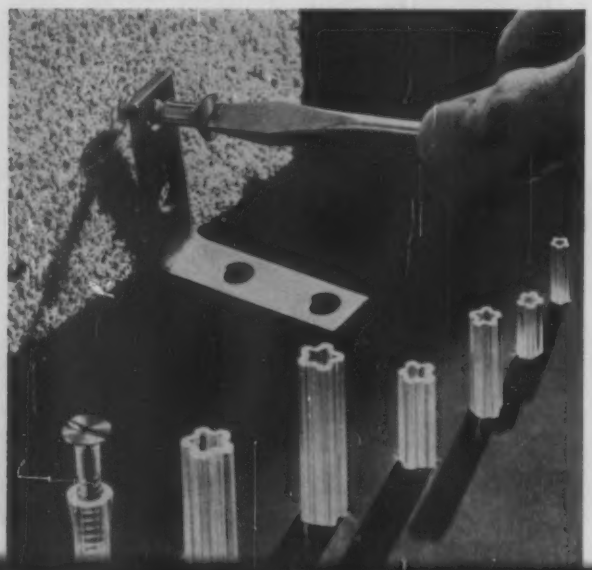
All-nylon fastenings weigh only one-sixth as much as stainless steel and one-half as much as aluminum, an important factor in some types of assemblies, such as aircraft components. Fastenings of this type also have a low dielectric constant and relatively high dielectric strength,

Rivet-type fasteners (above) made of various plastics. When integral pin is driven through shank of rivet, prongs spread and lock fastener in place. (Photo, Fastex Div.)



Unthreaded nylon nut (between materials being joined) receives self-tapping screw (top diagram). As screw is tightened, counterbored section of nut is drawn upward and outward, locking screw in place. (Photo, Tru-Lock Fasteners)

Cold flow of extruded butyrate anchors acts to secure nails and screws in brick, plaster, cinder block, etc., (Photo, Eastman Chemical)



enabling them to resist high voltage at commercial frequencies. In addition, they are unaffected by commercial solvents, alcohols, gasoline, oils, and boiling 40% caustic soda.

Black nylon screws and nuts are injection molded in a variety of sizes by Weckesser Co., Chicago, Ill. Molded to standard thread specifications, they offer high dielectric strength, good torque strength, light weight, and toughness over a wide temperature range. In general, these fastenings are recommended for applications where temperatures are below 300° F., or a service temperature not exceeding 275° F., when they are subjected to load. Thus assemblies incorporating the nylon fasteners may be subjected to repeated steam sterilization.

A number of companies producing plastics fasteners do not have a standard line but confine their activities to special-order items made up to customer specifications. Such items are usually made from rod stock on standard automatic screw machine equipment; (*To page* 214)

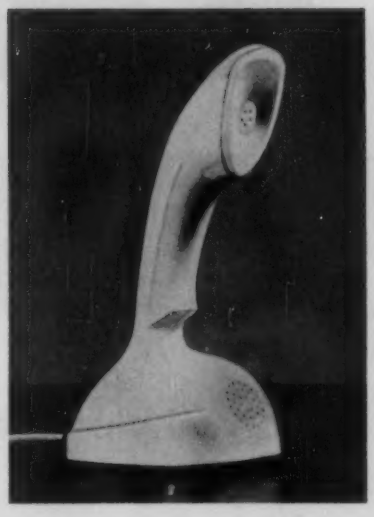
Revolutionary telephone combines base and handset into one unit, yet is not much larger than the handset alone of a traditional phone. (Photos, Northern Electric)

One-piece phone

Molded of styrene copolymer, new simplified instrument combines handset, base, and dial

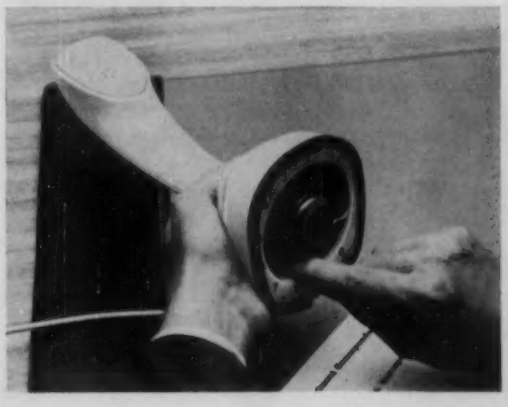
Relying heavily for its success on the design and engineering potentials of plastics materials, a new type of one-piece telephone recently introduced in this country by North Electric Co., Galion, Ohio, stands out as one of the most radical innovations since the now conventional two-piece handset-pedestal combination first appeared on the scene. As developed by North Electric's Swedish affiliate, L. M. Ericsson Telephone Co., many of the new instrument's strikingly modern design and utilitarian features revolve around an unusual upright housing made up of three pieces molded of Bakelite's C-11 styrene-acrylonitrile copolymer and cemented together. A number of minor plastics components, including an acrylic dial wheel and cover plate and several molded nylon parts, further contribute to effective performance.

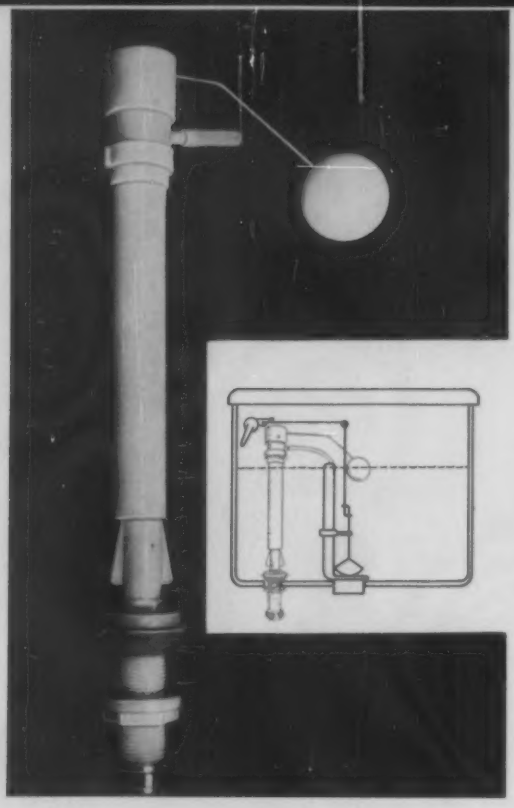
Key to the design of the instrument, known as the Ericofon, is the one-piece construction. All of the electrical mechanism is located inside the styrene housing and the dial face is attached to the base of the housing instead of to a separate pedestal. Induction coil, contact springs, capacitor, etc., are mounted on a compact chassis unit that rests on the reverse side of the dial face and fits neatly into the plastic housing. By using this type of construction, the company claims to have cut the (*To page* 236)



Housing for phone, containing all operating components, is molded of styrene copolymer in three parts which are later cemented together

Acrylic dial face and nylon switch button, which functions like a conventional cradle switch button, are located in base





Nylon float valve

A revolutionary new water closet valve incorporates seven molded nylon parts and is supplied complete with a polyethylene float. The materials were chosen because they are not adversely affected by the underwater conditions under which the valve must operate.

Adaptable to any tank through the use of standard supply fittings, the valve functions hydraulically rather than mechanically and has only two moving parts.

Packaged weight of the plastics valve is only 9 oz.; conventional brass valves weigh about 2 pounds. The resulting saving in freight costs is as attractive saleswise as is the ease of installation.

Credits: "Hydo" float valve manufactured by Hydo Valve Corp., Austin, Texas.
Zytel nylon and Alathon polyethylene supplied by E. I. du Pont de Nemours & Co., Wilmington, Del.

PLASTICS

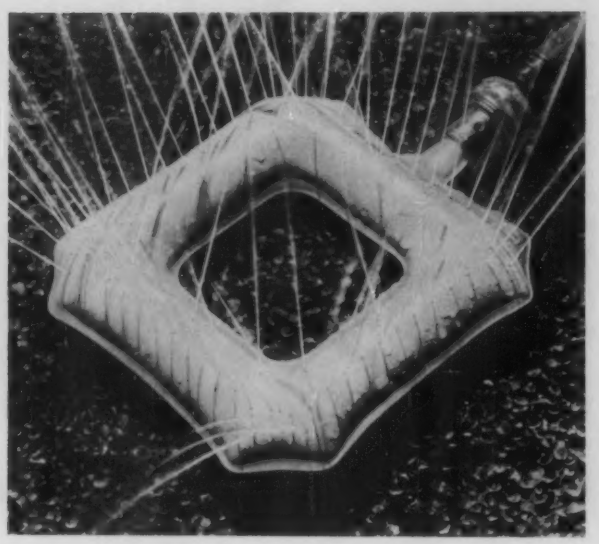
Polyethylene clothes hampers

Polyethylene was selected as the material for molding newly designed clothes hampers because of its resilience, light weight, and attractive appearance. Unlike wood or wicker hampers, the virtually unbreakable polyethylene models do not corrode or require maintenance. A grip is molded into each side of the hamper for convenience in lifting. The hamper itself is molded in two sections which are joined together with an aluminum extrusion that gives additional strength and dimensional stability to the walls.

The hampers are made in two sizes, and a variety of colors, including pearl, pink, yellow, blue, and green.

Credits: "Flex-Aire" hampers manufactured by Flambeau Plastics Corp., Baraboo, Wis.
Polyethylene supplied by Spencer Chemical Co., Kansas City, Mo.

Vinyl "Square Spray" sprinkler



A new type of lawn sprinkler made of vinyl sheeting has been designed for more efficient watering of small and odd-shaped areas. It is fabricated of 0.040 gage calendered vinyl which is die cut to shape and heat sealed electronically.

The sprinkler provides a square water pattern with remarkably well defined edges and corners, making it suitable for watering areas heretofore impossible to cover: along sidewalks where overspray is a nuisance, and in small flower beds and gardens. It works satisfactorily on low water pressure and, because of its gentle spray, can also be used as a children's play fountain. The bright yellow and green color of the sprinkler makes it easily seen and prevents damage from garden tools.

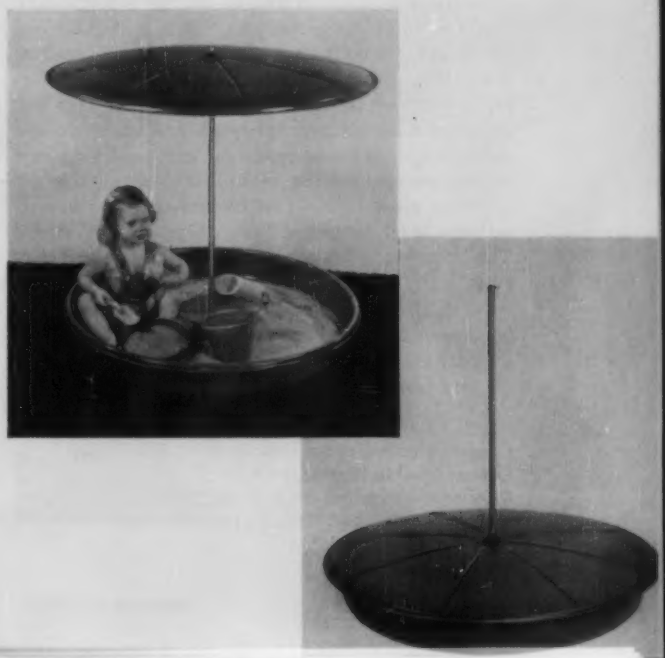
Credit: Manufactured by Resinite Dept., Borden Co., Chemical Div., Santa Barbara, Calif.

PRODUCTS

Vacuum formed styrene sandbox

A small corner of any yard can now be converted into a play area with the addition of a new sandbox, which comes equipped with a sunshade, both vacuum-formed from high-impact styrene sheet stock made from Dow's Styron 475. The box itself is a circular basin 5½ in. deep and 36 in. in diameter. When in use, the sunshade, which is 38 in. in diameter, is supported by an aluminum center post which is removable for storage. The canopy, when lowered, overlaps the sandbox for protection against dampness and stray animals.

Since it is vacuum formed in one piece, the sandbox has no screws or nails that might cause injury, and it will not rust or corrode. It is also equipped with a drain so that the unit can be converted to a child's wading pool.



Credits: Manufactured by Chippewa Plastic Mfg. Co., Inc., Midland, Mich. Sheet from Kal Plastics, Inc., Beverton, Mich.

Lamp shades

Originality in styling, design, and construction distinguishes a recently introduced line of acetate and butyrate lampshades. The shades are fabricated by a patented process called "Rotaflex," in which tubing is first extruded, and then coiled around mandrels, each spiral being adhesive-bonded to the next to form a variety of interesting shapes and sizes. Acetate shades are used for indoor lighting, butyrate for outdoor lighting where weather resistance is necessary.

The shades are washable and will not shatter in ordinary handling or use. They are available in nine diffused and three transparent colors.

Credits: Lampshades manufactured by The Heifetz Co., New York, N. Y. Tenite acetate and butyrate supplied by Eastman Chemical Products, Inc., Kingsport, Tenn.

PLASTICS

Nylon coffee topper

The strength of nylon and its ability to withstand high household temperatures makes it suitable for use in articles such as this coffee topper. Injection molded in a two-cavity mold, the coffee brewer top is made in black so that it will blend with the colors of most kitchen hardware and utensils. The coffee topper is made ready for use by sliding any rubber gasket over the neck; it is used just like an ordinary glass bowl. It will never crack or break, so there is no danger of flying chips and cut hands. The brewer top fits all glass coffee makers up to 8 cups.

While the present cost of the nylon coffee topper is somewhat higher than glass types, a "life-time" guarantee more than offsets the higher price and offers an added sales feature.

Credits: Coffee Topper manufactured by Plastics Consolidated Industries, Newark, N. J. Zytel nylon supplied by E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware.

Vinyl bowling grip

The Steve Nagy vinyl bowling grip holds promise of increasing the scores of bowlers everywhere because it prevents slipping. The knurled finger-grip, designed to be used in the middle finger hole of the bowling ball, is cast from a plastisol formulation. It is heart-shaped and has a number of circular ridges and a raised section to improve lift and to increase control of the ball. The back of the grip is coated with a special adhesive which, when moistened, holds the grip in place. The grip makes it possible for the bowler to cause the ball to increase its revolutions while travelling down the alley. The bowling grip is available in red, is resistant to deterioration by body oils, and is soft and flexible.

Credits: Steve Nagy bowling grip cast by Kee-Bair Products Co., Inc., Cleveland, Ohio, for Brunswick-Balke-Collender Co., Chicago, Ill. Geon resin supplied by B. F. Goodrich Chemical Co., Cleveland, Ohio.

PRODUCTS

Paint brush cleaner

Because it is impervious to common commercial solvents, nylon was selected for the housing mechanism of a device which does a thorough job of cleaning and drying paint brushes or paint rollers in about 60 seconds. Being manually operated, egg-beater style, the cleaner requires no outside power source. In use, the brush or roller is centered and locked in the simple clamp, dipped into solvent, and then spun in the air until it is thoroughly dry.

The housing is being produced in a two-cavity injection mold, 110 shots per hour. Each half of the housing contains molded-in bosses, holes for assembly screws, and a crank-shaft bearing. The gray finish requires no polishing and can be easily wiped clean after use.

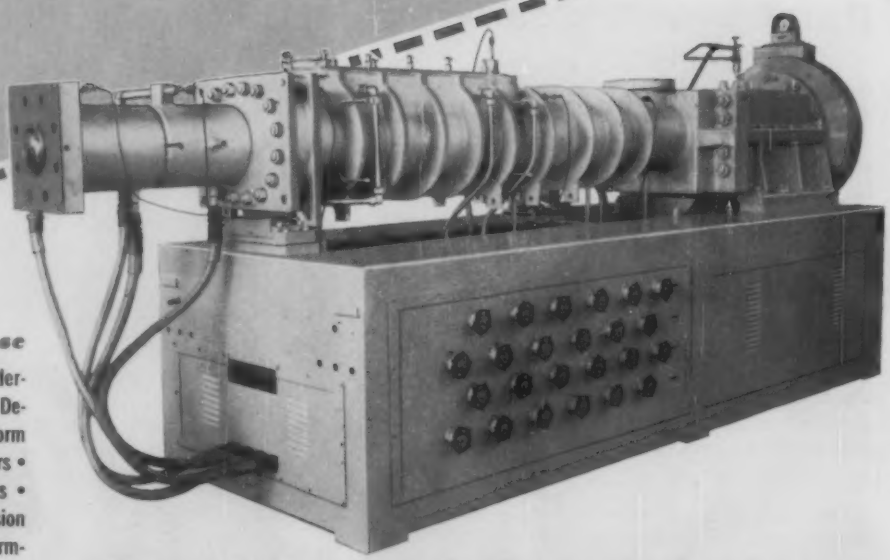
Credits: Spin-A-Brush manufactured by Portable Electric Tools, Inc., Chicago, Ill. Molded by Chicago Molded Products Corp., Chicago, Ill. Zytel 101 nylon supplied by E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware.

■ WELDING ENGINEERS' Compounder-Extractor-Extruders take the biggest production plans in perfect stride, accepting the job of 'profitable processing' of the most challenging new materials with complete confidence. Each new technological advance in plastics is an important W.E.I. stepping stone to greater success, new proof that, in all the plastics industry, there is no substitute for our patented Dual Worm design or our pioneering experience.

■ If YOU are making big plans for your future, this is the perfect time to see how much W.E.I. equipment will contribute to your success. Put your best investment foot forward . . . learn why W.E.I. machines are working day and night, year after year on the world's finest plastics production lines . . . with less space . . . less labor . . . less power costs. And, breaking all records for output rates and consistent quality!

■ Naturally, every customer's processing systems and processing plans are held in strictest confidence. Naturally, the planning stage is the correct time to go into conference with the W.E.I. specialists who have the know-how to help you most.

The Unique W.E.I. Dual Worm Design IS Your Custom-Fitted Key to Successful NEW PROCESSES and Higher Quality Standards



A Complete Line for Every Purpose

Dual Worm Compounder-Extruders • Dual Worm Devolatilizers • Dual Worm Rubber Extrusion Dryers • Single Worm Extruders • Complete Sheet Extrusion Systems • Vacuum Forming Equipment

SEND FOR CATALOG No. 663

WELDING ENGINEERS, INC.

NORRISTOWN, PENNSYLVANIA

Plastics Engineering

Dr. James F. Carley, Engineering Editor

Factors affecting quality in polyethylene extrusion

By B. H. Maddock†

Extrudate quality, which ranks in importance with output rate, has two bases: dimensional uniformity and mechanical homogeneity. The effects of design and operating factors on both these aspects of quality have been examined experimentally in 2-in. extruders, using polyethylene of melt index 2. The results suggest that the product of shear rate and dwell time, or the amount of shear, may be a fundamental factor governing the thoroughness of mixing. In general, extrusion quality is shown to be improved by increasing the back pressure (which reduces output), by increasing stock temperature, or by increasing the amount of mechanical work per pound of plastic. The ability (of operator *and* machine) to maintain the last two of these factors at satisfactory levels determines the ultimate useful output.

Extruders (like other producers) are constantly trying to raise their productivity. True productivity, for an extrusion machine, is its output of acceptable product. Thus productivity is a combination of output and quality, for without acceptable quality, increased output is wasteful rather than productive. The definition above implies that quality can be defined and measured. The purpose of this article is to define the quality of extrusion in a measurable way and to show the effects on quality of screw design and operating conditions.

While a number of excellent theoretical treatises (1,2,3,4,5)[1] covering the work of observers both in this country and abroad, have appeared in recent years, most of these have been concerned primarily with factors and conditions relating to viscous flow and pressure development in single screw extruders and to the delivery capacity of such machines. McKelvey and Bernhardt (5) have extended the theoretical concepts to include the situation where most or all of the necessary heat is supplied by mechanical action of the screw, and have indicated a probable future trend toward so-called "adiabatic" operation of extruders. Gaspar (6, 7) and the present author (8) have shown that the basic theories are indeed applicable to the extrusion of polyethylene while Gaspar pointed out some of the problems involved in the operation of single-screw extruders at greatly advanced screw speeds. Grant and Walker (9) have briefly reported

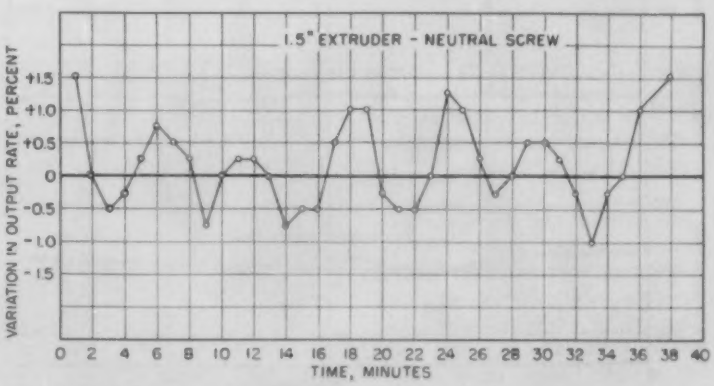


Fig. 1: Output versus time for 1.5-in. neutral extruder (screw run without cooling). Note cyclic character of output variation

*Reg. U. S. Pat. Off.
† Development Dept., Bakelite Co., Bound Brook, N. J.
From a paper presented at the 13th Annual National Technical Conference of the Society of Plastics Engineers, St. Louis, Mo., January 16, 1957
[1]Numbers in parentheses link to references on p. 235.

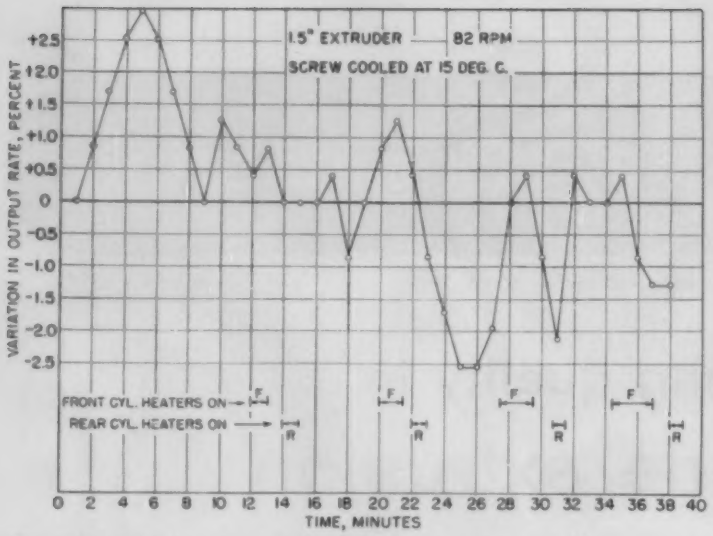


Fig. 2: Variations in output of water-cooled screw are much bigger than in neutral screw, show downward trend in output

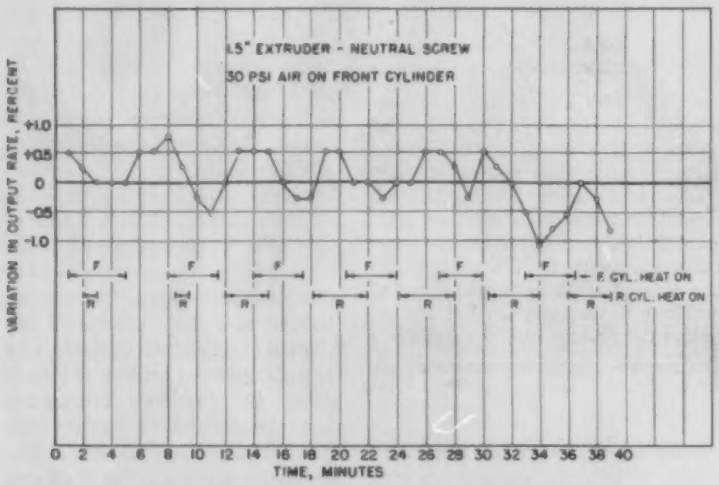


Fig. 3: Air cooling of front end of cylinder keeps heaters on longer, reducing temperature variations in barrel. Output variations, shown here, are correspondingly reduced. (See Fig. 1)

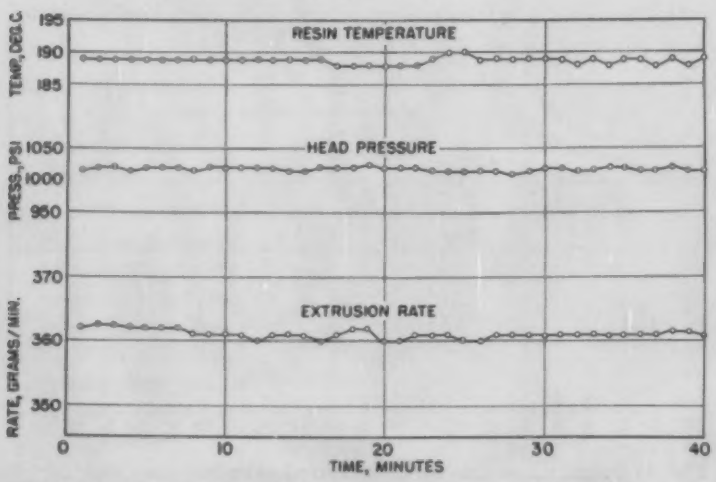


Fig. 4: Variation in exit melt temperature, pressure, and throughput for 2-in. screw, No. 1, running neutral. Rate variations span only 3 g./min. (±4%). No. 5 screw also showed little variation

on some of the factors contributing to mixing in the extrusion of polyvinyl chloride. Very little has been uncovered on what the writer has chosen to call "quality" in commercial extrusion practices.

Extrusion quality defined

For the purpose of this investigation, extrusion quality was divided into two broad categories —dimensional uniformity and mechanical homogeneity. Both represent problems with which the commercial extruder is constantly faced—the ability to hold size or gage and the necessity for establishing acceptable limits of surface roughness or other imperfections arising from non-homogeneities in the extruded product. The first, while frequently difficult to track to its source, usually results from some form of mechanical or thermal instability inherent in the design or operation of the extruder screw, the heating system, or the take-up equipment. The second and more common is affected by a number of design and operating variables but is related to what might be generally called the mixing efficiency of the screw.

Dimensional uniformity

Size control problems associated with faulty design or operation of take-up systems, although common enough in practice, are not considered herein, since they are purely mechanical in nature and are divorced from the extrusion operation.

Variability in delivery rate from the extruder, for whatever reason, obviously will be reflected as a dimensional variation in the extruded product. This may be severe or minor, periodic in time and magnitude, or occur at irregular intervals, depending upon the cause. When such variability is suspected, its existence can easily be detected by cutting and weighing the extrudate at convenient intervals of time, usually one minute, and plotting the rates so obtained against time. A graph of this type is shown in Fig. 1, p. 123. The data on this graph were obtained on a 1.5-in. extruder with a neutral, metering type screw, operating at a cylinder temperature of 175° C. and a screw speed of 82 r.p.m. extruding polyethyl-

ene resin with a melt index (MI) of 2.0 through a die 0.125 in. in diameter and 0.500 in. long. The variations in this case were not large, about ±1%; in some cases such variations might not be detected in the extruded product. Note, however, that the variability is periodic in nature, with peaks occurring every 6 to 7 minutes.

Operating with a cooled screw (water at 15° C.) caused about a 40% reduction in average output rate and somewhat greater variability (±2.5%), see Fig. 2, page opposite. It was noticed during the latter portion of this run that the front and rear cylinder heaters came on at intervals of 6 to 8 min. and remained on for periods of only 1 to 2 minutes. Furthermore, it appeared that the variations in output rate correlated with the periodic operation of the heaters.

It was then reasoned that more uniform heat input to the cylinder could be accomplished by removing a portion of the heat. Compressed air at 30 p.s.i. was blown through the cooling cores of the front cylinder section and a third run was made with a neutral screw. This is shown in Fig. 3, page opposite, where it is seen that the heaters still came on at periodic intervals of 6 to 7 min., but remained on for a greater proportion (50 to 60%) of the time. This resulted in a reduction in magnitude (to ±0.5%) of the cyclic variation in output rate but the period remained the same, 6 to 7 min., and equal to the period of the heater cycles.

Other materials may be more sensitive than polyethylene to the type of variability described above. For example with fluorothene (trifluorochloroethylene), rate variations of ±15% were not uncommon in this extruder, resulting in complete loss of dimensional control.

This, then, is one form of variability leading to dimensional control problems. The heater bands on the extruder were of high capacity—3000 w. in each zone—and the control thermocouples were located close to the cylinder liner and too far from the heaters, resulting in heat surges,

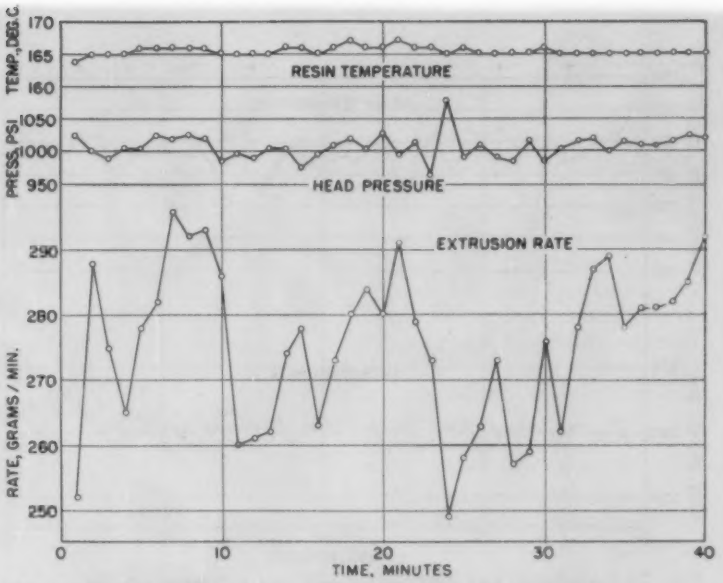


Fig. 5: Variations in pressure and output for No. 2 screw, water-cooled, are very large. Note that output variations lag behind pressure variations by about 1 minute

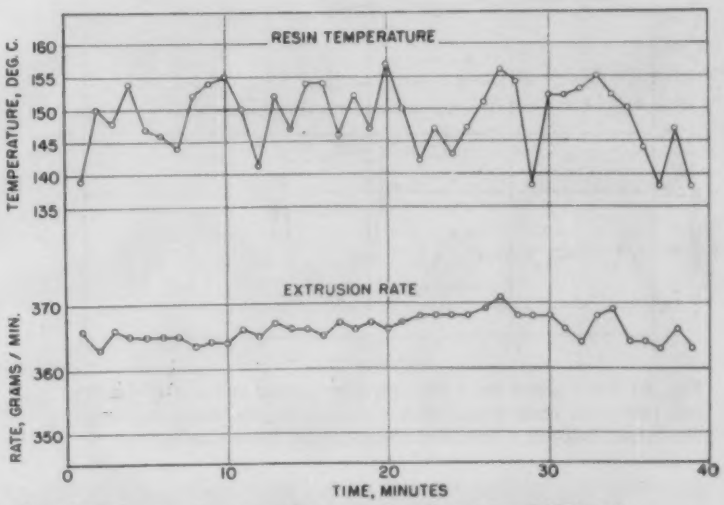


Fig. 6: With screw No. 3 running neutral at 48 r.p.m. and 1250 p.s.i., resin temperature varied widely but output was regular

Table I: Screw dimensions[a]

Type of screw:	Metering		Decreasing pitch		Decreasing depth
Screw No.:	1	2	3	4	5
Pitch at feed, in.	1.0	2.0	2.90	2.6	2.0
Pitch at discharge, in.	2.0	2.0	0.75	1.0	2.0
Depth at feed, in.	0.370	0.250	0.33	0.37	0.281
Depth at discharge, in.	0.062	0.120	0.38	0.37	0.126
Compression ratio	5.4	2.0	4.0	2.5	2.0
Length of metering zone, in.	6.0	6.0	—	—	—

[a] All five screws had major diameters of 2.0 inches.

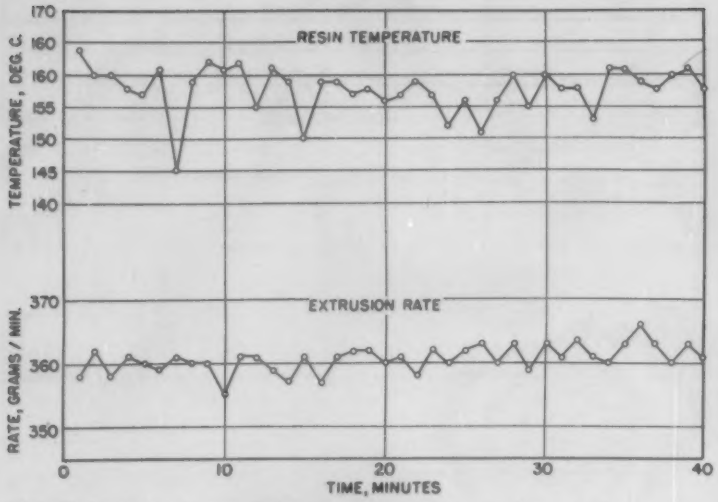


Fig. 7: Variation in exit melt temperature and extrusion rate for screw No. 4 running neutral at 34.5 r.p.m. and 1240 p.s.i.

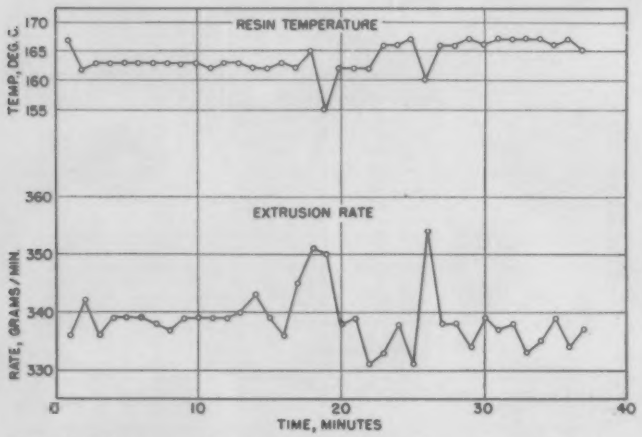


Fig. 8: When screw No. 3 was run with cooling water at 84 r.p.m. and 1080 p.s.i., resin temperature rose and became more uniform; but output dropped a little and became much more erratic

Table II: Effect of pressure and cylinder and screw temperatures at 36 r.p.m. with screw No. 3

Screw Temp.	*Pressure*	*Quality rating and output* — *Cyl. 190° C.*		*Cyl. 148° C.*	
°C.	*p.s.i.*	*Rating*	*Output*[a]	*Rating*	*Output*[a]
Neutral	700	5	44	5	39
	1500	2	29	4	33
	3000	1	2	1	12
100	700	4	35	5	33
	1500	2	26	4	28
	3000	1	8	1	15
30	700	1	24	4	23
	1500	1	18	3	20
	3000	1	8	2	16

[a]Outputs are given in pounds per hour.

and a cyclic in-pouring of heat into the barrel. The controllers, although they were designed to anticipate demand, were unable to proportion the heat input in such a manner as to prevent or compensate for the cyclic effect. A more desirable condition would be one where, if high-wattage heaters are used to facilitate machine warm-up, the voltage can be reduced during continuous operation. This is accomplished automatically in at least one extruder of recent design. Proper attention should also be given to the choice of electric controllers and the location of thermocouples. With simple on-off controllers, the thermocouples should be located close to the heaters. With proportioning- or anticipating-type controllers, the thermocouples can be farther from the heaters to read truer cylinder temperatures. The most ideal set-up would be the use of stepless or saturable-core reactor-type controllers with thermocouples located as close to the cylinder wall as possible.

Fortunately, the above type of variability is the exception rather than the rule, but it may be more prevalent than realized in older electrically heated extruders. It would probably be less significant in large extruders, where a major portion of the heat may be generated by mechanical action, and essentially non-existent in steam-, water-, or oil-heated machines.

Effect of screw design and operating conditions

Another type of output rate variability arises from factors in screw design and screw temperature control. Five 2-in. screws having L/D ratios of 15:1, described in Table I, p. 125, were evaluated in a steam-heated extruder, extruding Bakelite polyethylene DYNH (MI = 2.0) through a 1.5-in. gate valve and a die 0.188 in. in diameter and 0.500 in. long. The extrudate was cut and weighed at 1-min. intervals. Resin temperature and pressure were measured in the head by means of an immersion-type thermocouple and grease-filled Bourdon gage, respectively, and recorded each minute. The rear

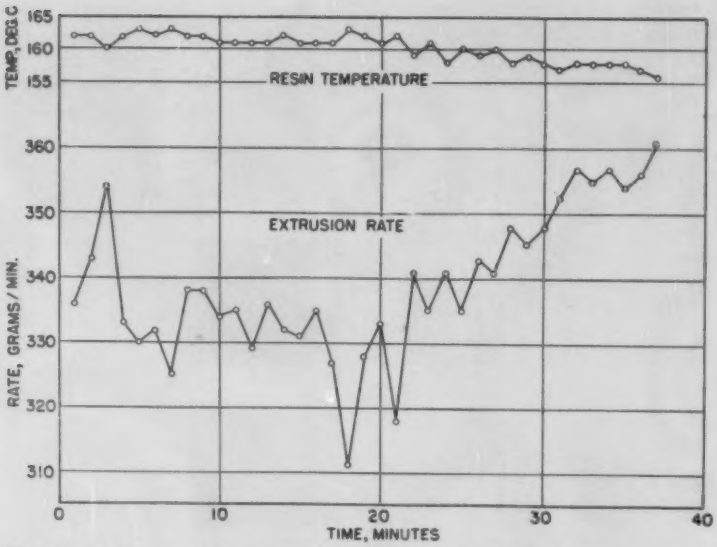


Fig. 9: When screw No. 4 is water cooled and run at 84 r.p.m. and 1100 p.s.i., it too attains greater temperature uniformity but suffers from much more erratic output. (See Fig. 7)

resin temperature and moderate variability in rate under neutral operating conditions, see Fig. 6, p. 125, and Fig. 7, opposite. This is explained on the basis of a lower order of mechanical shear and frictional heat development, compared to shallower channel screws, resulting in lower and more erratic resin temperatures. This, in turn, is reflected as variations in output rate. When these screws were controlled at low temperatures (14° C.) and the screw speeds increased to maintain comparable output rates (Fig. 8, page opposite, and Fig. 9, left), the temperature variability was reduced, but the variability in output rate was increased markedly.

The extreme variability in output rate obtained with screws 2, 3, and 4 when operated at a low

cylinder was operated at 186° C. (150 p.s.i. steam), front cylinder at 193° C. (180 p.s.i. steam) and the die at 175° C. The head pressure could be adjusted by means of the gate valve to simulate different die or screen conditions if desired, although most of the work was carried out at a head pressure of about 1000 p.s.i. Screw speeds were adjusted to give an output rate of approximately 48 lb./hr., wherever possible, to equalize errors in cutting and weighing.

The shallow-channel, metering-type screw, No. 1, and the decreasing-depth-type screw, No. 5, gave essentially constant pressure, output rate, and stock temperature at all operating conditions. Figure 4, p. 124, is typical of the results obtained with these two screws, the slight variations noted being within the limits of error in the measurements. Metering type screw No. 2 gives similar behavior at most operating conditions. However, under severe screw cooling conditions (2.2 gal./min. of water at 14° C.), this screw gave extremely variable output rates and pressures, as illustrated in Fig. 5, p. 125, although the stock temperature remained constant.

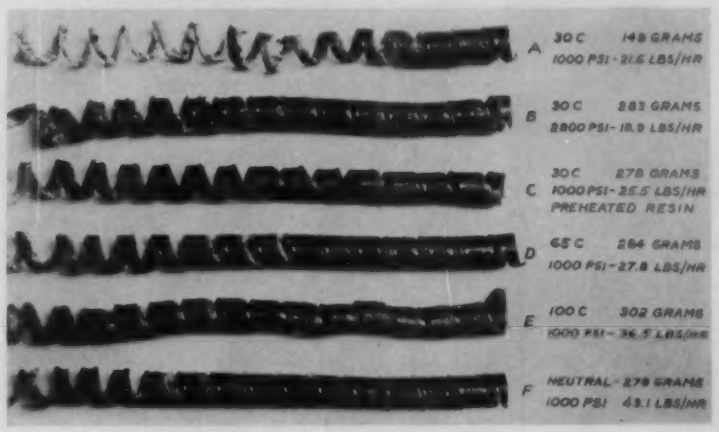
The deeper-channel, decreasing-pitch-type screws, 3 and 4, gave rather severe variability in

Table III: Effect of screw speed, pressure, and cylinder temperature at a screw temperature of 100° C.

Screw speed	Pressure	Quality rating and output[a]			
		Cyl. 190° C.		Cyl. 148° C.	
r.p.m.	p.s.i.	Rating	Output	Rating	Output
24	Low (600-1100)	3	24	3	22
48		5	46	6	44
72		6	64	—	—
24	High (1400-2500)	1	15	2	17
48		1	31	5	37
72		3	46	6	54

[a]Outputs are given in pounds per hour.

Fig. 10: Contents of screw No. 2 under different extrusion conditions. Samples were obtained by shutting down and quickly pulling screw. There was probably a little less molten material in the operating screw than shows in photo because some heat is picked up in cylinder while screw waits to be pulled



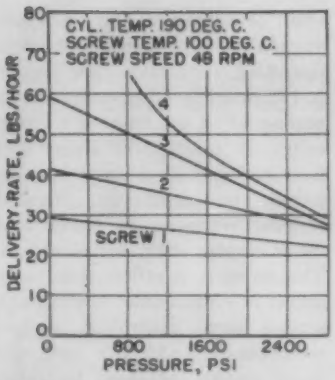


Fig. 11: Operating characteristics with polyethylene of MI=2

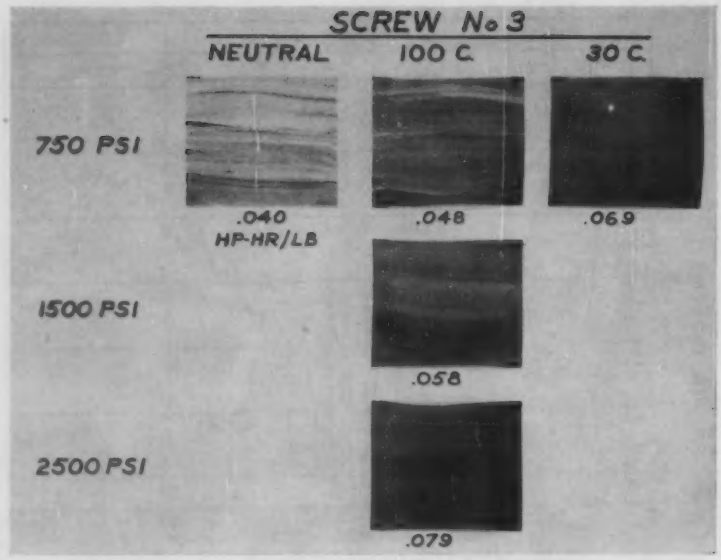


Fig. 12: Photos of pressings made from extrudates of screw No. 3 under various operating conditions

screw temperature has not been completely explained. In the case of screw No. 2, severe cooling reduces the melting capacity of the compression zone, causing an apparent starving effect in the rear threads. This results in a marked reduction in output rate and delayed melting; therefore only the forward two to three turns of the thread (metering section) are completely filled with melt. The latter is illustrated in Fig. 10A, p. 127, which shows a screw helix obtained by stopping the extruder and forcing out the filled screw. The material being extruded was a mixture of natural polyethylene pellets blended with a small quantity (5%) of a red polyethylene compound. Raising the head pressure from 1000 to 2800 p.s.i. (Fig. 10B) causes earlier fluxing and increased resin inventory, but results in a further reduction in output rate because of increased back flow in the screw channel. Preheating the resin to 80° C. (Fig. 10C) partially overcomes the reduced melting capacity of the cold screw (A), giving increased inventory and output rate. Raising the screw temperature to 65° C. (Fig. 10D) and 100° C. (Fig. 10E) gives further increases in inventory and output rate. Neutral operation (Fig. 10F) gives maximum output rate but a smaller inventory and less rapid fluxing than the 100° C. controlled condition (Fig. 10E) because the cold material entering the feed port keeps the screw cooler in this area.

Table IV: Effect of pressure at equal output rates

Output rate lb./hr.	Screw temp. °C.	Pressure p.s.i.	Quality rating and screw speed — Cyl. 190° C. Rating	Cyl. 190° C. Speed[a]	Cyl. 148° C. Rating	Cyl. 148° C. Speed[a]
41	Neutral	700	5	36	5	36
		2000	2	42	4	42
34	100	700	4	36	5	36
		2000	1	55	3	46
24	30	700	1	36	4	36
		2000	1	49	1	46

[a]Speeds are in r.p.m.

The general effect of screw temperature control is to cause a layer of cooler, often unfluxed, resin to adhere to most of the screw's length, reducing the effective channel depth at the output end and therefore the delivery rate. How this also results in improved mixing is discussed later.

It is apparent that output variability and associated dimensional control problems can arise from the type of screw design and operating conditions. Metering type screws having a depth of 3/8 in. or more at the feed hopper and a depth of 1/8 in. or less in the metering section are relatively free from this defect with polyethylene cubes. Screws having deeper channels or decreasing pitches are more subject to this type of variability because they develop less frictional heat. Screw cooling tends to reduce the variability in resin temperature but in some instances produces extreme variations in output rate. Increasing the operating pressure raises the resin temperature levels and reduces the rate variability slightly, although this effect is minor and will not produce a variability level with a deep channel screw equivalent to that inherent with a shallow screw.

A third type of output rate variability — pulsations corres-

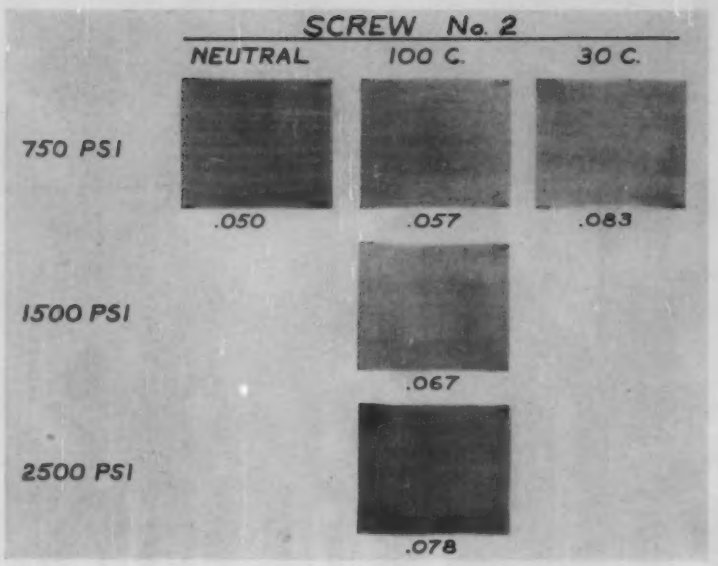


Fig. 13: Pressing of extrudates from screw No. 2 show better homogeneity than those from screw No. 3. (See Fig. 12)

ponding to each revolution of the screw—was not studied in detail. This type of variability is usually accompanied by a cyclic trace on the chart of a recording wattmeter or ammeter in the drive motor input circuit or on the chart of a recorder measuring the pressure in the extruder head or die. It may or may not be detectable in the extruded product, but has been observed in thin film as a line marking or heavier section occurring at perodic intervals corresponding to the screw speed and extrusion rate. In heavy (40-mil) sheeting extruded from a center-fed die, this pulsation occurs as a spiral marking in the center of the sheet. It is more likely to be troublesome with deep-channel screws operating at low die resistances and head pressures and can usually be eliminated or reduced to a negligible quantity by raising the operating pressure. This can be accomplished with heavy screen packs or, better, by a valve between the extruder head and die.

Product homogeneity

A more subtle type of quality defect is that arising from mechanical or thermal non-homogeneities in the extruded material and manifested by surface roughness, color streaking, or other external or internal imperfections. This type of defect is related to the mixing efficiency of the screw and is affected, as will be shown, by a number of design and operating factors. Surface roughness may also be caused by local disturbances of the flow in the region of the entrance to the restricted portion of the die—so-called melt fracture (10). However, this occurs at considerably higher shear rates than were encountered in the experiments reported here.

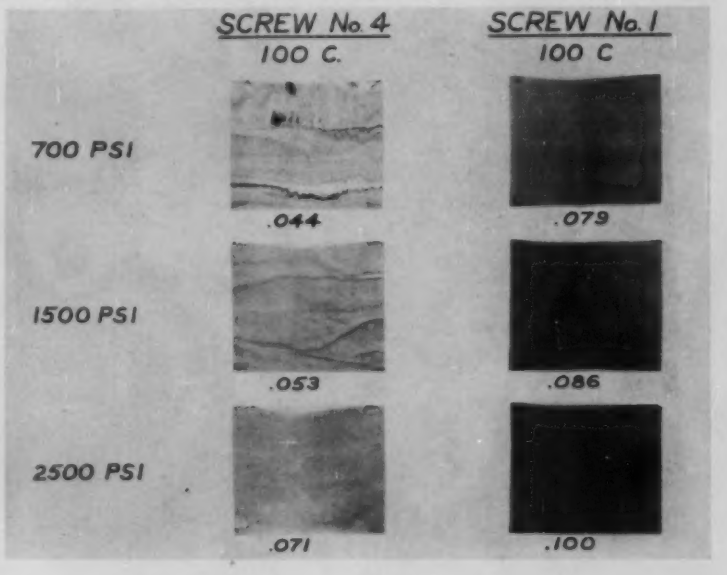
Mixing efficiency

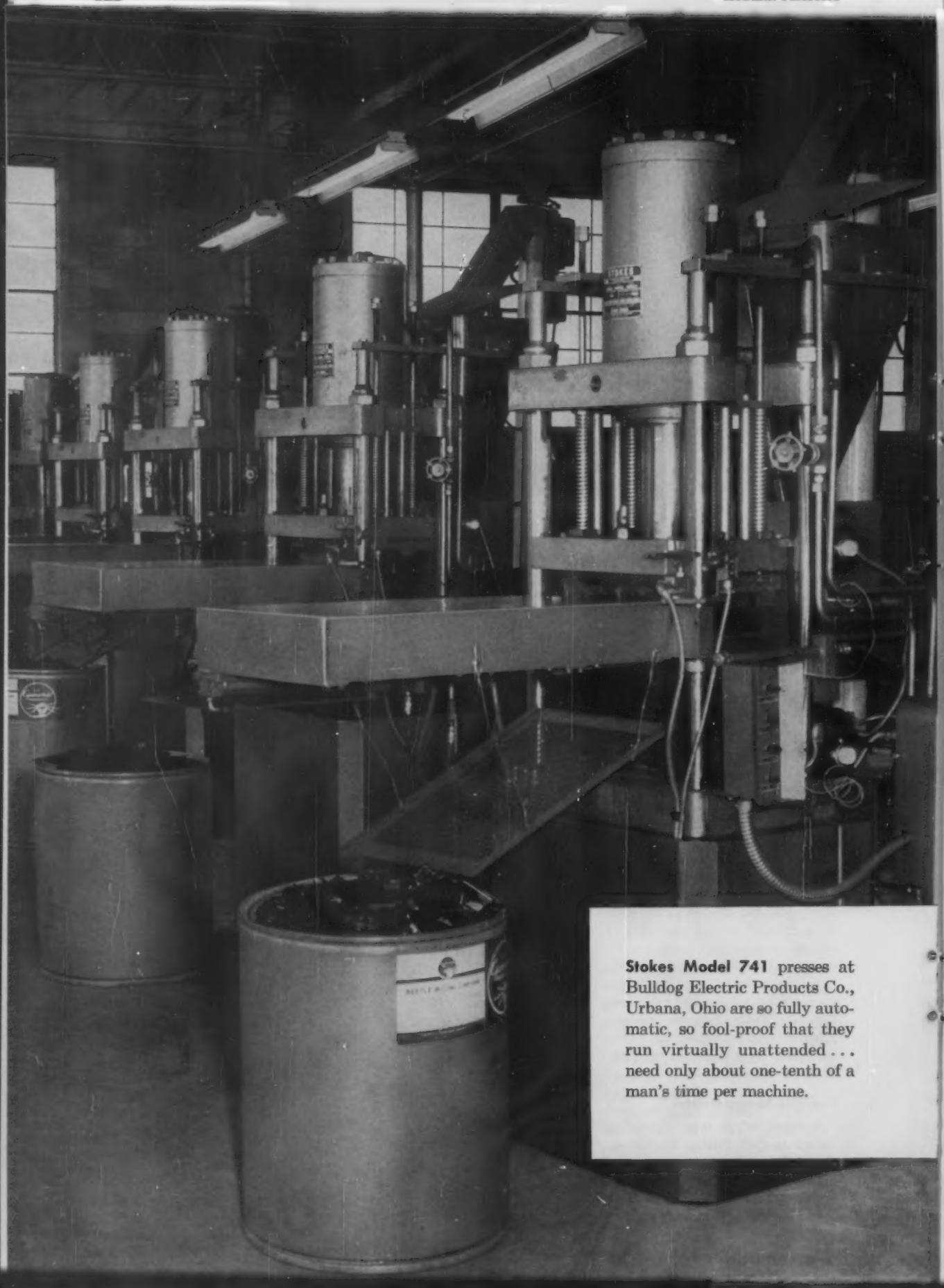
Mixing efficiency was studied with the first four screws listed in Table I. Characteristic delivery rate-versus-pressure curves are shown for these screws in Fig. 11, p. 128, when operated at 48 r.p.m. with a cylinder temperature of 190° C. and a screw temperature of 100° C., extruding polyethylene of MI = 2.0. Screw No. 1 gives the lowest delivery rate for a given pressure or die resistance, because of the shallow channel, and the flattest rate-versus-pressure curve due to the greater resistance of the shallow channel to back flow. Increasing the channel depth or volume at the delivery end increases the open-discharge rate and the steepness of the rate-versus-pressure curve in accordance with basic theory.

Since it was suspected that the amount of working done on the polymer would be an important factor in mixing, the horsepower delivered to the screw was measured directly with a Prony brake. In Ref. 8 it was shown that when the exit melt temperature at 48

(*To page* 132)

Fig. 14: Extrudates of screw No. 4 (deep flights, decreasing pitch) are much less homogeneous than those from screw No. 1, a shallow-flighted, metering-type screw





Stokes Model 741 presses at Bulldog Electric Products Co., Urbana, Ohio are so fully automatic, so fool-proof that they run virtually unattended . . . need only about one-tenth of a man's time per machine.

"Bulldog Electric" plastic parts molded to high manufacturing standards on Stokes Model 741 presses...

Fully automatic compression molding, on Stokes Model 741 presses, produces close-tolerance electrical distribution equipment parts around the clock at Bulldog Electric Products Co.'s Urbana, Ohio plant.

When molding "goes fully automatic" with Stokes presses, quality is high and costs are low. That's the experience of many custom molders and plant molding departments. Bulldog Electric Products Co., for instance, has a battery of Stokes Model 741 50-ton presses that turn out plastic parts for electrical fixtures. Used with both general and special purpose phenolics, melamine and urea formaldehyde compounds, these presses run 24 hours a day. They give high precision and uniform quality that easily meet requirements of Bulldog's Standards Department -- plus volume and economy that the production group must have in this competitive industry.

In spite of constant operation, Bulldog's superintendent reports "maintenance has been nominal, and overall performance of each machine has equalled or excelled the manufacturer's predictions."

J. A. Kempf, superintendent of Bulldog's Plastic Division, examines parts molded in Stokes Model 741 presses.

For your own molding operations, it will pay you to check the advanced features of the new Stokes 741 that bring you fully automatic compression molding in its most fool-proof, most productive form. Built into these presses are refinements that we have developed during our 25 years of leadership in automatic molding:

Parts can't fall back into molds . . . due to metal-to-metal contact between feed and comb, and scrape-off discharge independent of gravity.

Simplified set-up . . . feed changeovers made in five minutes. Pre-set loading board provides custom-adjusted feed for each job as part of the tooling.

Fast cycle, high output . . . average dry cycle time only 8 seconds.

Space-saving . . . in-line press design cuts floor area requirements, lets you line up feed and discharge in convenient rows.

Tops in versatility . . . top or bottom ejection available to suit the job . . . readily adaptable to side-draw split cavity molds, to direct feed from pre-heater, or, with Stokes rope feeder, to automatic feed of rope pre-mix.

Press capacities of 50, 75, 125 and 200 tons are available. Write today for a copy of our new bulletin on the Model 741, for a consultation on your requirements, and for a cost study on your specific application.

Plastics Molding Equipment Division
F. J. STOKES CORPORATION
5540 Tabor Road, Philadelphia 20, Pa.

STOKES

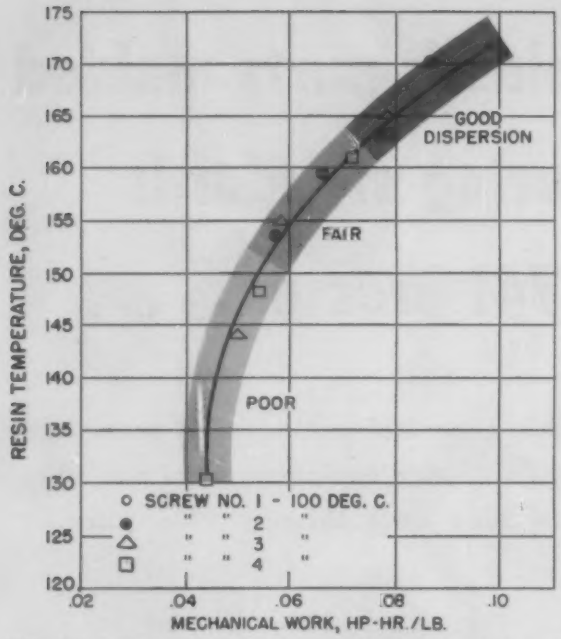


Fig. 15: "Map" of melt temperature and mechanical working. Resin temperature attained in all four screws is about the same for a given amount of working, and quality improves with increasing working and temperature

r.p.m. is plotted against work input (hp.-hr./lb.), the points for all four screws fall on a single curve.[2] In these runs a mixture of colored (red) and natural polyethylene was extruded through a gate valve and a die 0.188 in. in diameter and 0.500 in. long. Samples of the extrudate were pressed into 40-mil sheets; the degree of dispersion was rated as good, fair, or poor.

Pressed samples of extrudates made at three pressures and screw temperatures are shown in Fig. 12, p. 128, for screw No. 3 and in Fig. 13, p. 129, for screw No. 2. The samples in Fig. 14, p. 129, taken at various pressures with 100° C. water in the screw, show the marked differences obtained at the same screw speed with screws 1 and 4. The numbers under the specimens are the work input in hp.-hr./lb. Examination of these photos suggests that homogeneity can be improved either by decreasing the screw temperature or by raising the pressure (increasing the percentage of back flow). There is an indication that good dispersion might be obtained only at mechanical energy inputs above a certain level, regardless of the screw used. Superimposing the dispersion ratings on the temperature-work input curve of Ref. 8 gives the plot of Fig. 15, left, which tends to confirm the indication, but also suggests that resin temperature is a significant variable and that temperatures above a certain level might be necessary to give good mixing. Extrusion rate, which governs the time for which the plastic is subjected to the shearing action, must also be taken into account.

Because of these uncertainties, additional experiments were set up in an effort to define more completely the effects of the several variables. Using screw No. 3, two levels of cylinder temperature (148° C. and 190° C.), three levels of screw temperature (neutral, 100° C. and 30° C.), and three pressure levels were investigated at a screw speed of 36 r.p.m., this condition being known to give poor mixing with a neutral screw at low pressures. Effects of screw speed (24, 48, and 72 r.p.m.) were then studied at one screw temperature (100° C.) and

[2]Calculations show that considerable heat was supplied by conduction in those runs where total heat input amounted to less than 0.07 hp.-hr./lb. Thus the concordance of all these points indicates that the differences in the design of these screws had negligible effect on the heat-transfer rate.

Fig. 16: Effects of resin temperature and pressure on extrudate quality

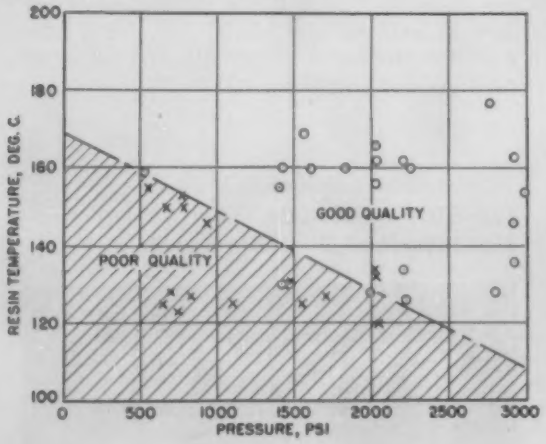
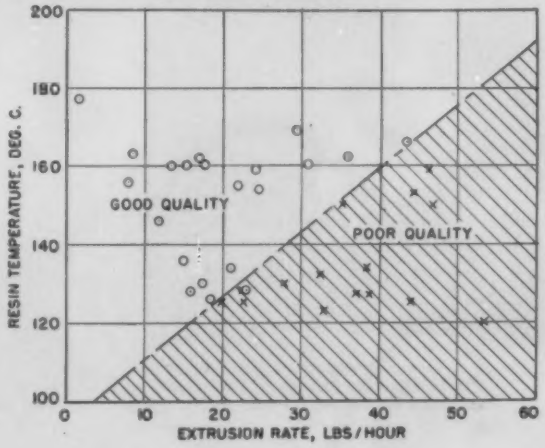


Fig. 17: Effects of extrusion rate and resin temperature on extrudate quality



the two cylinder temperatures. Finally, in an attempt to compensate for the loss in output rate caused by an increase in pressure, the screw speed was raised until the original rate was obtained. Quality was judged visually, using an arbitrary numerical scale made from selected samples representing degrees of dispersion from 1 (best) to 6 (worst). Grades 1 and 2 were considered to be above an acceptable quality level or "good," while grades 3 to 6 were unacceptable or "poor."

The results of these experiments are too voluminous to report in full and are difficult to portray graphically because of the number of variables and their inter-related effects. Three primary effects are noted—those caused by changes in pressure, resin temperature, and extrusion rate. A change in any of these variables produces changes in one or both of the others. General effects are indicated in Tables II, III, and IV and in Figs. 16 to 18.

In Table II, p. 126, quality is seen to improve with increasing pressure, increasing cylinder temperature, and decreasing screw temperature at a fixed speed with screw No. 3. Note that quality of grade 1 was obtained only at very low outputs; grade 2 quality, however, was possible at rates up to 29 lb./hr., about 60% of the open-discharge rate of this screw at 36 r.p.m. Note how the use of cooling water reduces the screw output at all pressures. This reduction is probably caused by stagnation of chilled melt on the screw root.

The data of Table III, p. 127, show that quality deteriorates as screw speed is increased, and that better quality, again, is obtained at the higher pressures and cylinder temperatures at relatively low throughputs.

Table IV, p. 128, shows the effect of raising the pressure and compensating for the resultant loss in output by increasing the screw speed. In each case the quality was improved.

In all three tables, increasing pressure was accompanied by better quality. This is due to several effects associated with the pressure increase. First, the increase in pressure is effected by closing the gate valve, i.e., increasing the resistance to discharge. This, at any screw speed or temperature, raises the percentage of back flow as it raises the pressure. The material recirculates more, both in the forward and transverse directions.

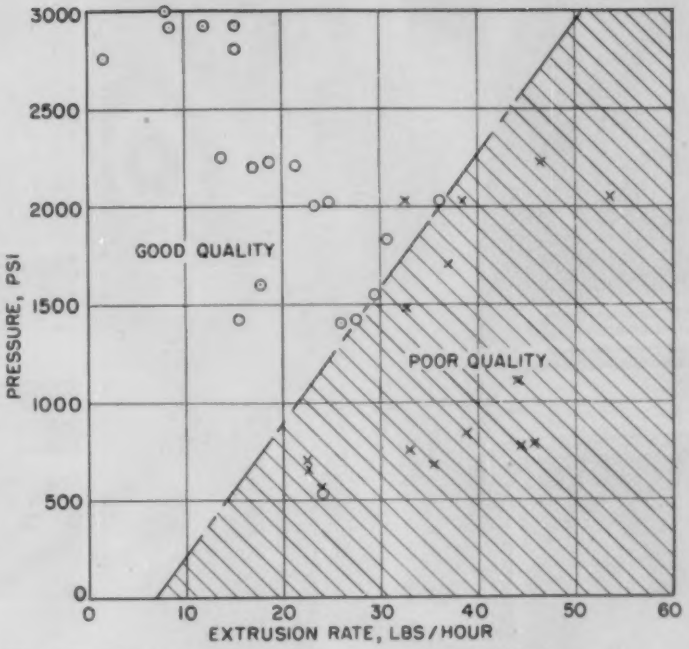


Fig. 18: Effects of pressure and extrusion rate on quality

The central factor seems to be the amount of shear the plastic receives, and the amount of shear is the product (or an average product) of shear rate and dwell time *in the molten state*. In *melt*-fed extruders, screw speed should have little influence on amount of shear since shear rate is directly proportional to speed while dwell time is inversely proportional to it. However, this extruder is not

(*To page* 136)

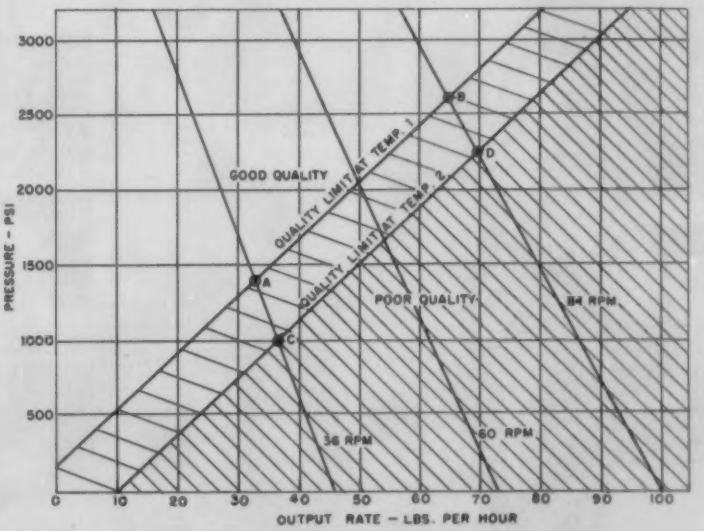
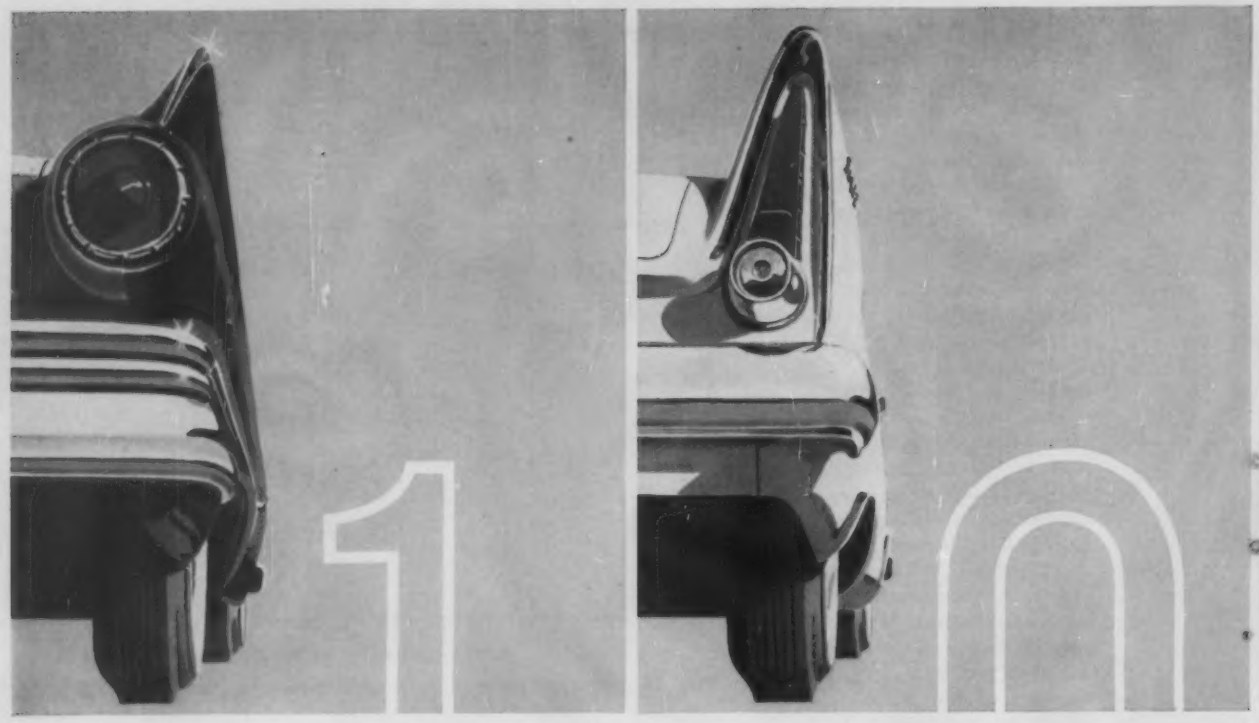
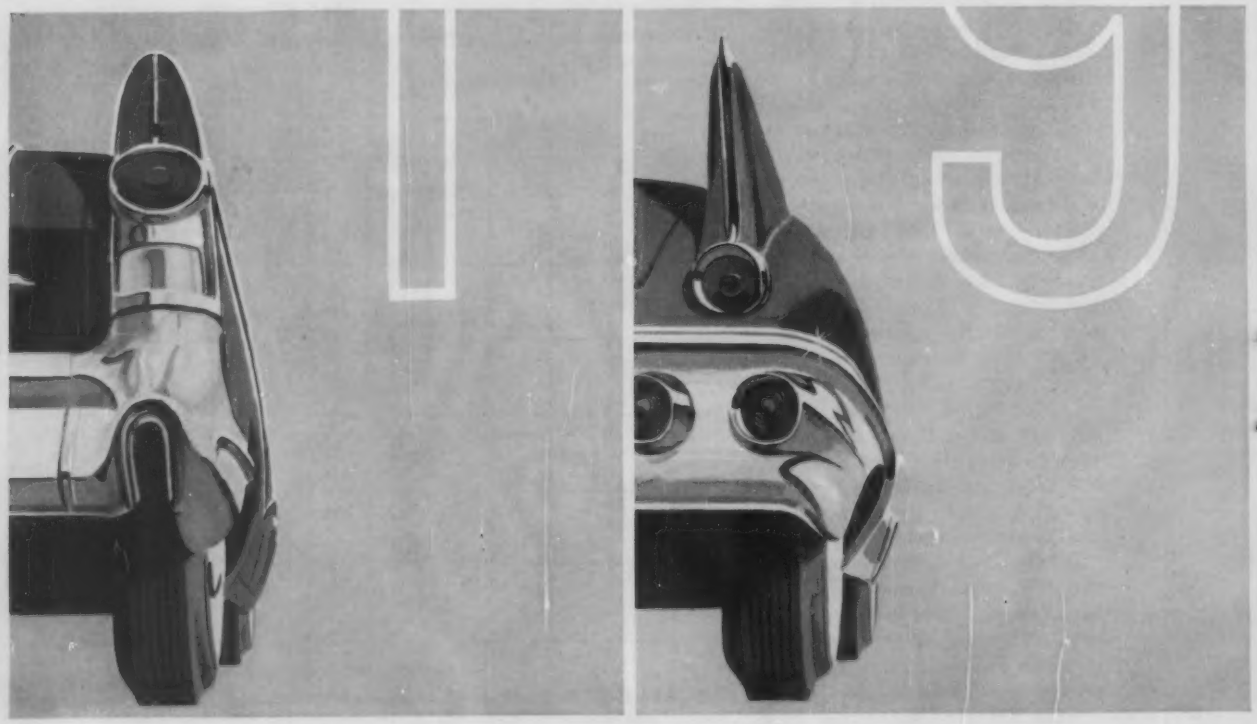
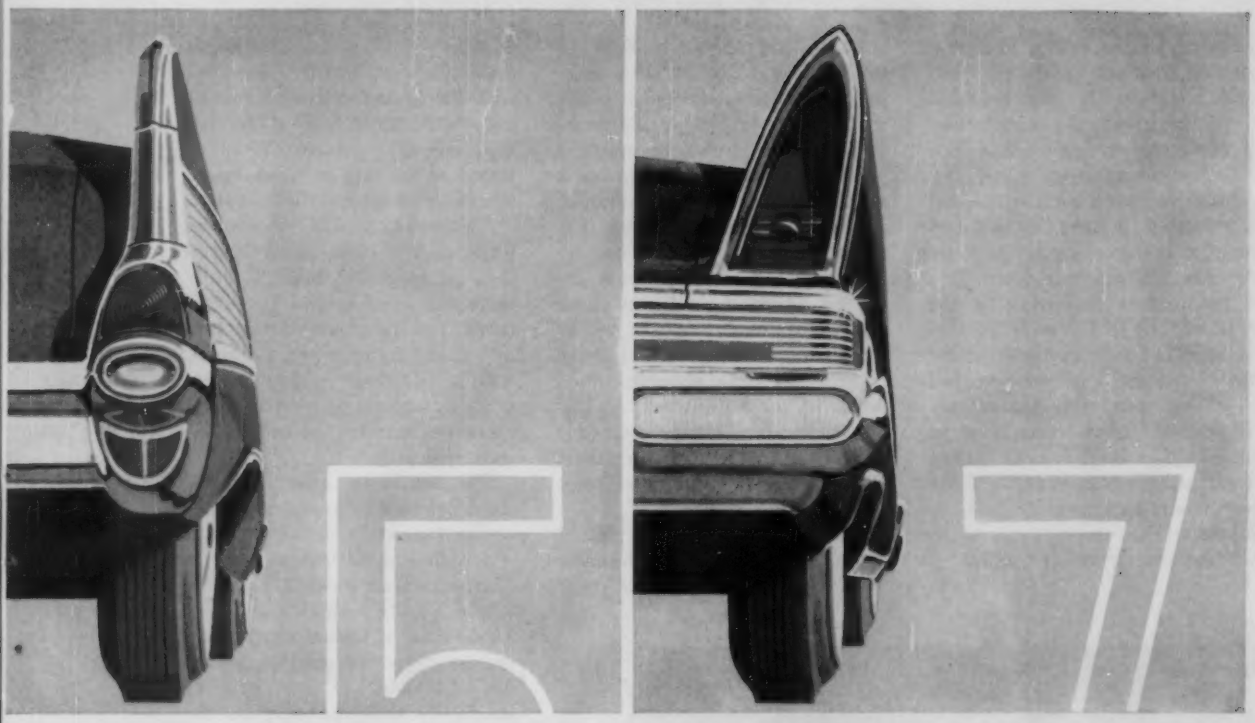


Fig. 19: Combined effects of rate, temperature, and pressure on quality and output of screw No. 3. Temperature 1 is higher than 2



What do they have in common?





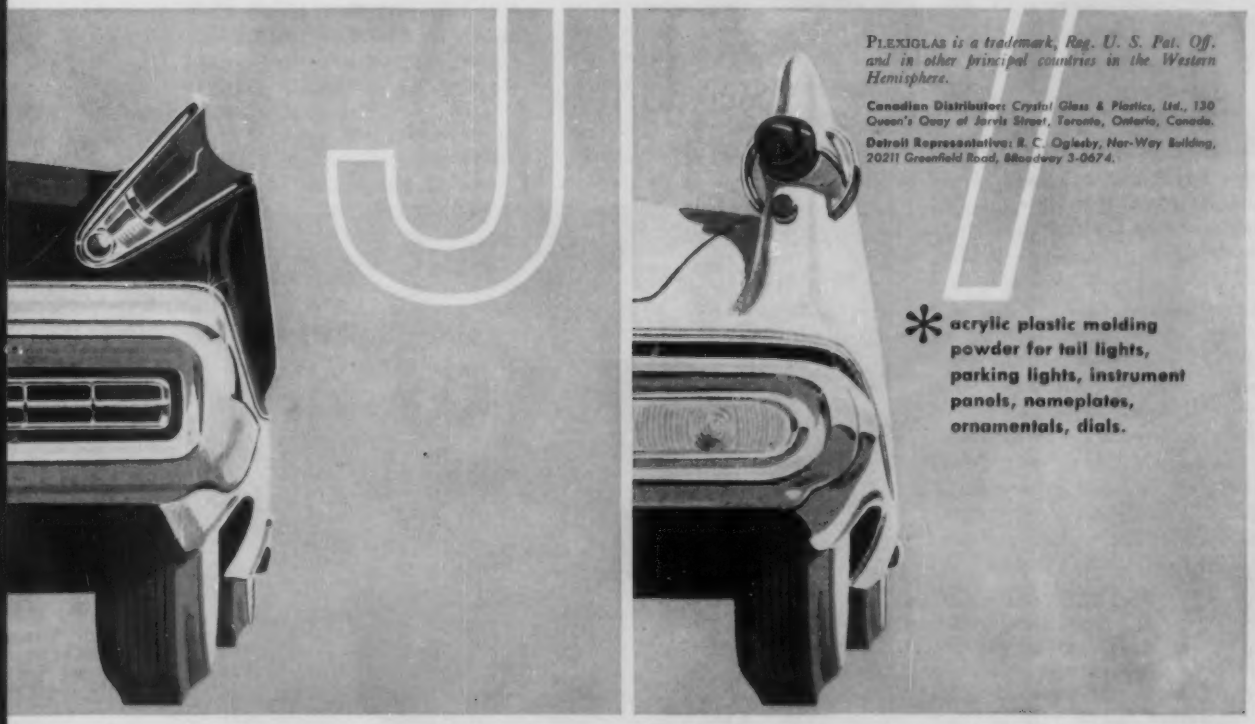
Plexiglas*

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries



PLEXIGLAS *is a trademark, Reg. U. S. Pat. Off. and in other principal countries in the Western Hemisphere.*

Canadian Distributor: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.*

Detroit Representative: *R. C. Oglesby, Nor-Way Building, 20211 Greenfield Road, BRoadway 3-0674.*

* **acrylic plastic molding powder for tail lights, parking lights, instrument panels, nameplates, ornamentals, dials.**

melt-fed; in fact, as Fig. 10 shows, melting does not take place until well along in the water-cooled screw. And, since the contribution of conducted-in heat diminishes with increasing screw speed, the point of melting advances as speed is increased, leaving less and less time for the shearing action to do its work. Homogeneity drops. This is the picture presented by the data of Tables III and IV. Because it is not known just where the screw melting had occurred in these runs, the amount-of-shear idea is not considered to have been proved. It is offered as a plausible explanation of these results and as a possible guide to future work.

Relations between pairs of variables are shown in Figs. 16 to 18. In Fig. 16, p. 132, resin temperature is plotted against pressure for all conditions of operation, with the circles representing points of good quality (grades 1 and 2) and the crosses points of poor quality (grades 3 to 6). It is seen that quality is improved by increasing either the temperature or the pressure, although both may occur simultaneously, one as a result of the other. Good quality is achieved only above suitable levels of these variables. At low pressures a higher temperature is necessary than at high pressures. The effect of extrusion rate is not indicated in this graph.

Resin temperature is plotted against extrusion rate on the same basis in Fig. 17, p. 132. This graph indicates that quality degrades with increasing extrusion rate at a given temperature level and that the resin temperature should be raised as the rate or screw speed is increased to maintain quality.

Figure 18, p. 133, shows the pressure-extrusion rate relationship on a similar basis. It indicates that quality can be maintained with increasing output rate by raising the pressure, assuming sufficient latitude in screw speed and drive power to overcome the reduction in output caused by the increased pressure.

The combined effects of the three primary extrusion variables —rate, temperature, and pressure —may be summarized on a single chart as shown in Fig. 19, p. 133, where quality ratings are superimposed on a typical rate versus pressure plot for extruder screw No. 3. Good quality product would be achieved only in the area below the quality limit line A — B at machine temperature 1 or below the line C — D at a higher machine temperature 2. This chart defines the levels of all variables at which a satisfactory product could be produced. At point *A*, for example (1400 p.s.i. at 36 r.p.m.) the maximum delivery rate of good quality material would be 33 lb./hr. Any attempt to raise the output by raising the screw speed without

(*To page* 231)

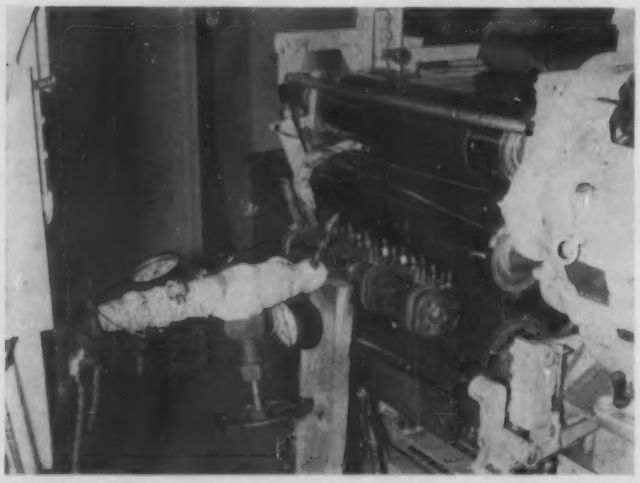


Fig. 20: Extruder output end set-up, showing how valve may be used with sheeting die

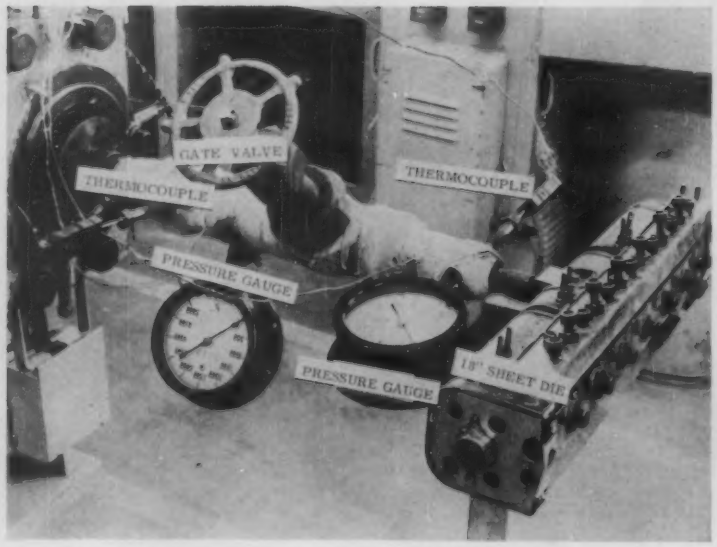


Fig. 21: Valve regulation of productivity (output times quality) in actual manufacture of sheeting

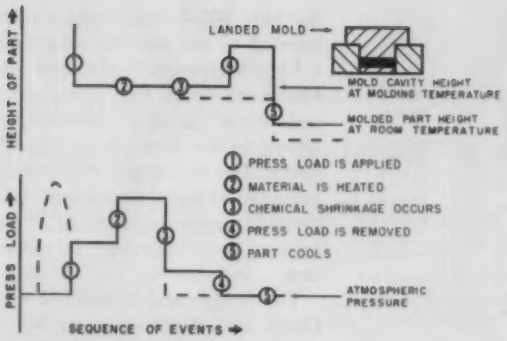


Fig. 10: Pressure and volume relationships in landed compression mold

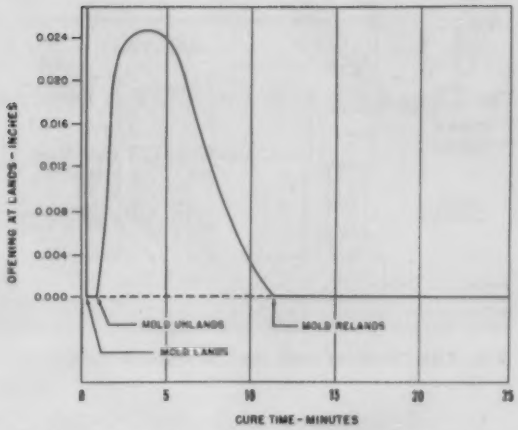


Fig. 11: Punch travel of landed radome mold

Volume and pressure effects in compression molding–Part II

By W. R. McGlone and L. B. Keller**

Part I, of this article, which appeared last month, dealt with measurements of punch movement during compression molding in an unlanded mold. The concluding half of the article, which follows here, discusses the results of experiments with a landed mold in which the pressure was measured during the compression molding operation.

Pressure and volume relationships

Figure 10, above, presents diagrams for the landed mold that are comparable to those in Fig. 1, Part I, for the unlanded mold. Notice that in the landed mold, molding takes place at essentially constant volume in contrast to the unlanded mold in which it takes place with constant pressure on the part. Therefore, the same process sequence results in different effects:

1) After the material is placed in the cavity, a constant press load is applied. As the mold closes, the pressure on the part may build up and then drop away (broken line) as material flashes past the punch, relieving some of the compression of the part. The mold, closed to the lands, has the total press load carried jointly by the part and the lands. The part height is reduced to the closed cavity height of the mold.

2) Since the volume of the cavity does not change, the tendency of material to expand due to heating by the mold results in an increase in the press load carried by the part, and in a reduction in the press load carried by the lands; the volume is unchanged.

3) Chemical shrinkage now occurs. If it is not great enough to offset the effects of compression and thermal expansion, there is again merely a shift of press load, and the load on the part is now less, as shown by the solid lines. Of course, since the punch is not unlanded, the volume of the material in the mold is not affected by pressure change.

However, the shrinkage might be enough to overcome the compression and thermal expansion. The part would then shrink away from the cavity and the pressure on the part would be lost. The broken line shows the behavior of a part of this type at this stage and throughout the remainder of the cycle.

4) The press load is removed as the mold is opened, and the part springs back or decompresses (solid line). A part with high chemical shrinkage would show no change (broken line) as the mold is opened.

5) The part is removed from the mold and contracts as it cools to room temperature.

As in the description of unlanded molding (Part I), the events described in Fig. 10 were separated to show more clearly the direction of their action; some of them actually occur simultaneously. Also note that in the landed mold the effective pressure on the part, i.e., that part of the press load not carried by the lands, varies with the volume of material in the mold.

Another point must now be clarified. It was stated above that molding in a landed mold takes

* Member of the Technical Staff, Hughes Research and Development Laboratories, Culver City, Calif.

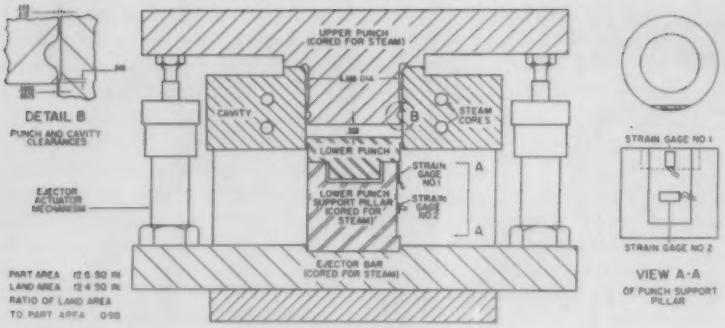


Fig. 12: Details of mold used in pressure measurements

place at essentially constant volume after landing. This is true except in certain unusual cases. The case in which shrinkage may be high enough to reduce the part volume to less than that of the cavity has already been discussed. Another is that in which the effect of thermal expansion is great enough to overcome the press load and cause the mold to open at the lands. This may result from the use of an excessively high charge weight or a low clamping load.

To verify the above, an indicator was mounted to show the travel of the punch of a landed radome mold. Figure 11, p. 137, shows the travel of the punch during molding of a typical part. Notice the similarity between this curve and the punch-travel curves in unlanded molding. Naturally, the punch of the landed mold does not trace the complete curve of the unlanded mold because it returns to the lands and is unable to follow all of the shrinkage of the part, the last portion of which merely results in a transfer of a portion of the press load from the part to the lands.

Experimental verification—measurement of pressure

Pressure on the molded part in the landed mold was measured during molding by recording the compressive strain of an annular ring supporting the punch, which is the bottom of a simple disk mold cavity (Fig. 12, above). The mold used was different from that employed in the punch-travel work since the latter mold had a wedge-shaped bottom punch in which all the pressure on the part would not have been transmitted to the supporting pillar (Fig. 4, Part I).

Two temperature-compensated Baldwin SR-4 strain gages were bonded to the annular ring with a high-temperature phenolic adhesive to form two arms of a resistance bridge circuit as shown in the diagram in Fig. 13, below. The two gages, which were mounted at right angles and connected in appropriate arms of the bridge, gave improved temperature compensation.

The bridge was connected to a Leeds and Northrup Azar Millivolt Recorder so that the response of the strain gages could be continuously plotted. The entire set-up is shown in Fig. 14, below. Press loads were measured by reading the gage on the hydraulic system. This gage had previously been calibrated in terms of pressure at the platens, determined with an NBS-certified Morehouse Proving Ring. Calibration of the strain-gage bridge output voltage in terms of actual press load on the lower punch was done by putting into the cavity an aluminum disk thicker than the closed-mold cavity height and applying a range of press loads. This process was repeated at the desired press load before and after each part was molded.

A dial indicator was fastened to the press and adjusted to read the final travel of the press platen as the press closed (Fig. 14). The indicator was set to zero with

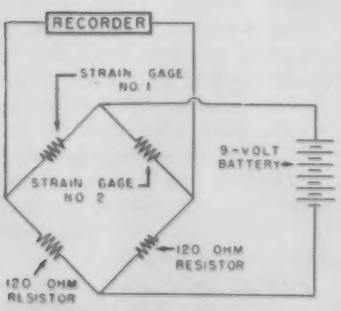
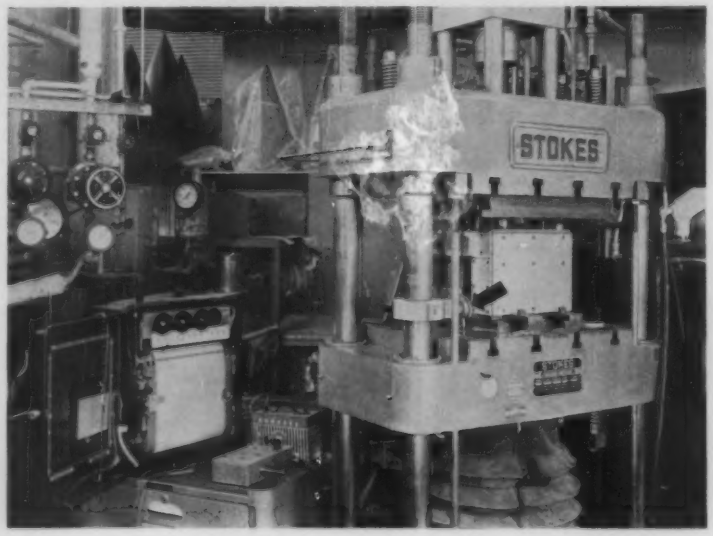


Fig. 13: Bridge circuit for pressure measurements

Fig. 14: Measuring set-up, showing (left to right) recorder, bridge, battery, mold in press. Note indicator (arrow) on press



THE MARK OF QUALITY

BARBER COLMAN

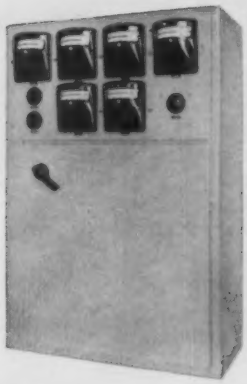
Wheelco Instruments

Precise temperature control boosts capacity of molding machine

Preplasticizing unit on these Watson-Stillman molding machines increases capacity up to 90 ounces. Unit heats material to a plasticized state and delivers it to the injection cylinder ready for molding. Outstanding user benefits include: shorter molding cycles, improved shot thickness control, lower injection pressures, and greater uniformity in material and coloring.

Latest type heating cylinder of the PE-64 machine depends on six Wheelco 400 Series Capacitrols for precise, continuous, multi-zone temperature control of the internally heated torpedo. Extreme accuracy and dependability of Wheelco Instruments makes them ideal for across-the-board installations in the plastics industry.

Survey the plastics industry — either quickly or thoroughly — and be convinced that Wheelco leads in instruments without any shadow of a doubt. Then, call your nearby Wheelco field engineer for the quickest and best solutions to your temperature control problems.



Watson-Stillman PE-64 preplasticizing-type injection molding machine has working temperatures controlled by six Wheelco 400 series Capacitrols shown mounted in separate control center.

BARBER-COLMAN COMPANY

Dept. P, 1517 Rock Street, Rockford, Illinois, U.S.A.

BARBER-COLMAN of CANADA, Ltd., Dept. P, Toronto and Montreal, Canada

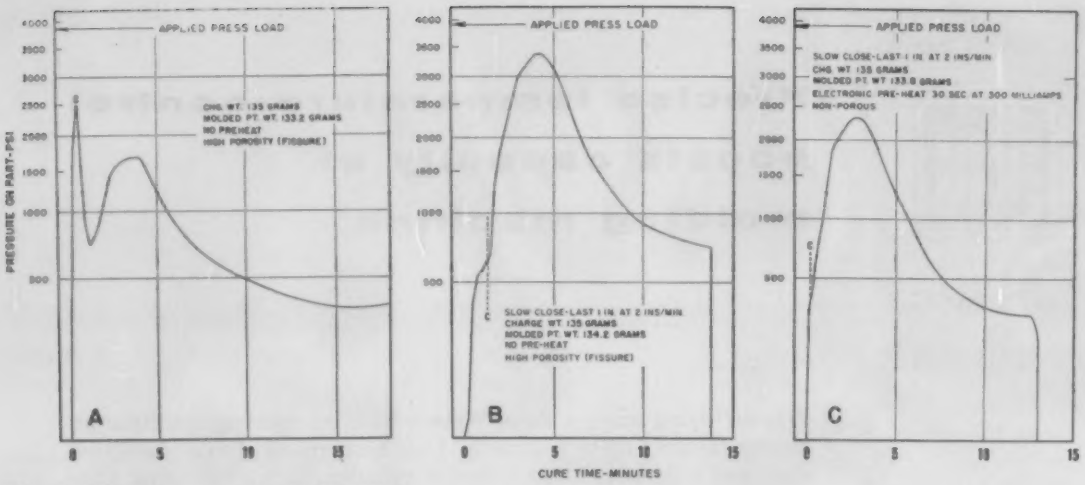


Fig. 15: Pressure curves for Diall 50-01

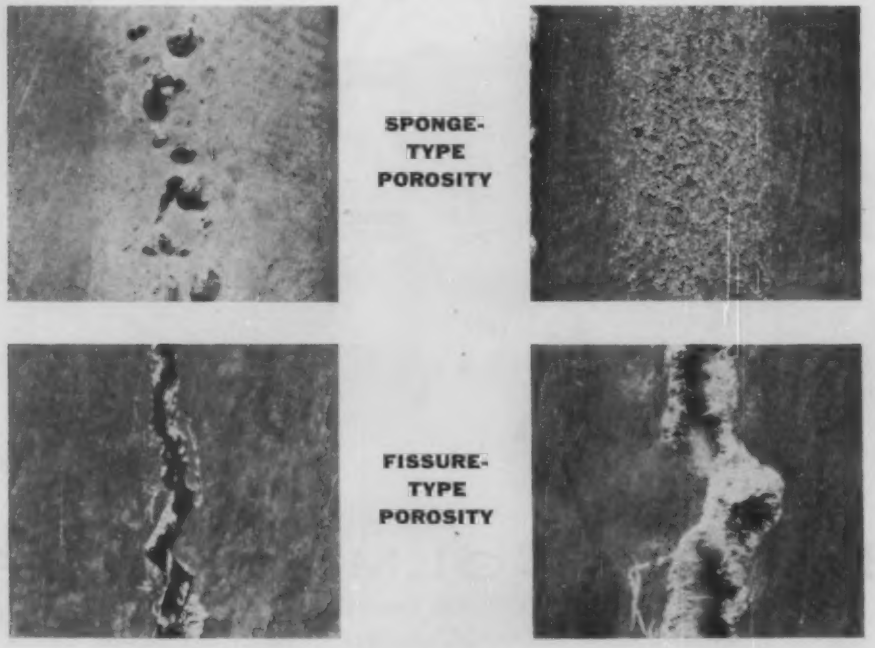
the empty mold closed to the lands. When the actual molding was carried out, it was therefore possible to tell the time at which the mold landed. The simple shape of the molded part, and the fact that the entire bottom of the mold acted as a column measuring the pressure changes, minimized errors due to point-to-point differences in shrinkage of the material (in the mold).

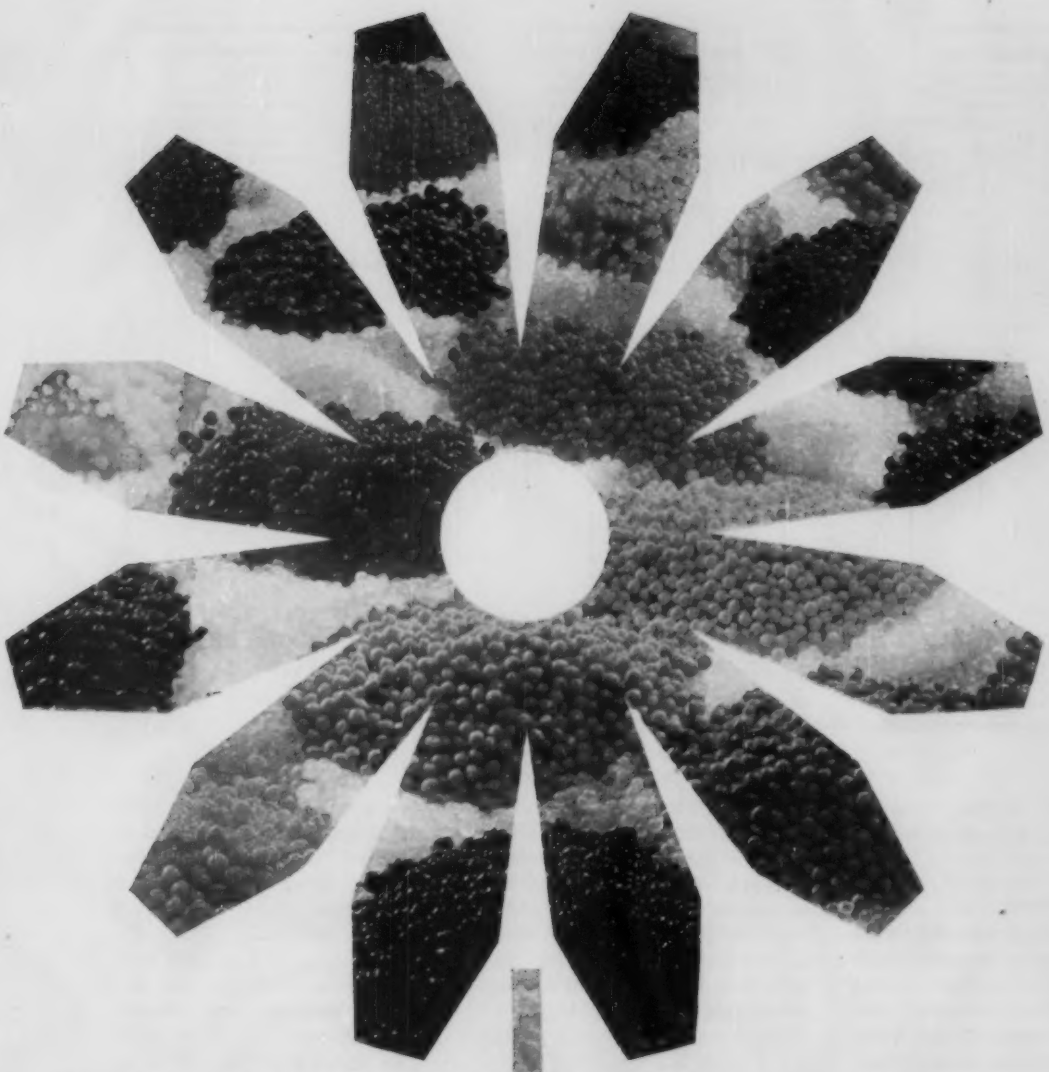
Since the mold deflects and expands slightly under the applied pressure, the constant-volume assumption is not strictly fulfilled. However, steel has a very high elastic modulus and the mold base was extremely thick (as a glance at Fig. 12 will show), so the effect here is so small as to be negligible.

Measurements of pressure in the mold made in this manner are influenced by friction in the mold assembly; however, this also was minimized by making the cross section circular.

In Figs. 15, 17, 18, 19, and 21, the time-pressure curves are enlargements of the recorded strain curves, and the pressure scale on the vertical axis is taken from the strain gage calibration described above. The areas of the punch over which the strain was measured did not deform linearly with load because of the shape of the punch support and the location of the gages. This resulted in a non-linear relationship between recorded strain and cali-

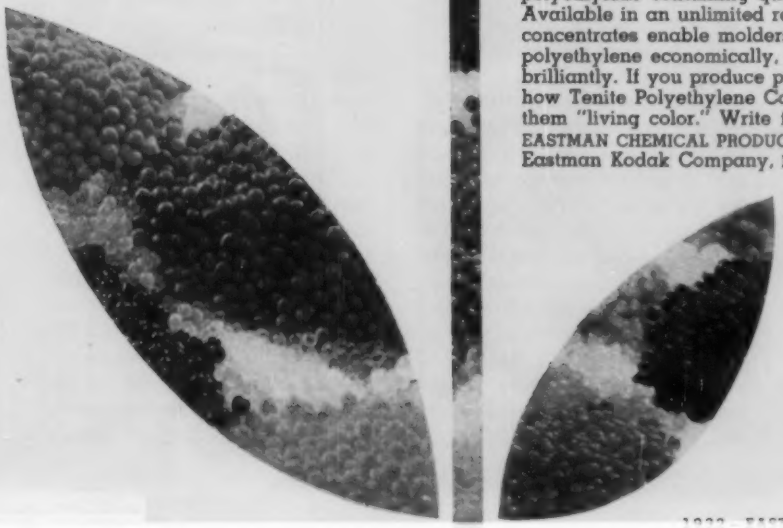
Fig. 16: Porosity types (4X magnification)





Tenite Polyethylene Color Concentrates add "living color" to polyethylene

Tenite Polyethylene Color Concentrates are pellets of polyethylene containing quantities of coloring agents. Available in an unlimited range of colors, these concentrates enable molders and extruders to color polyethylene economically, uniformly and brilliantly. If you produce products of polyethylene, find out how Tenite Polyethylene Color Concentrates can give them "living color." Write for information to: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.



TENITE
POLYETHYLENE
an Eastman plastic

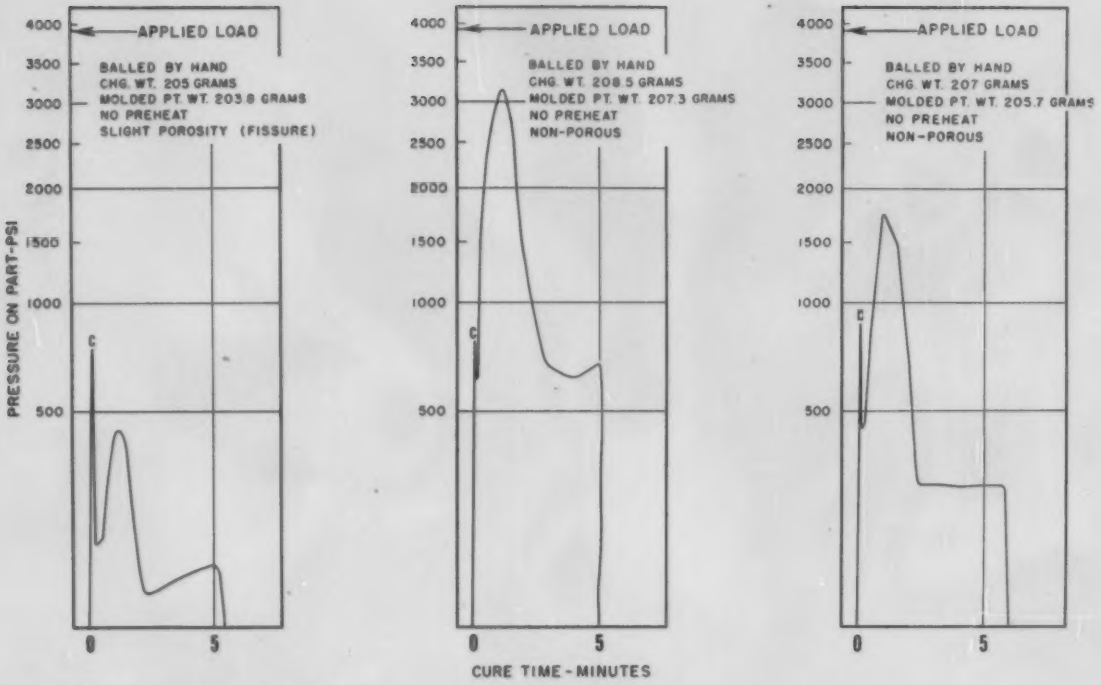


Fig. 17: Pressure curves for alkyd 446

brated loads so that pressure scales on the graphs are also non-linear.

Pressure curves

The pressure developed in the landed mold cavity was measured by the above method during molding of parts of various materials. All parts except those of alkyd 446 were molded from loose material at 300° F. and a 25-ton press load. Except where noted, the mold was closed rapidly (the last 6 in. at 24 in./min.). Other molding conditions are shown on the graphs to follow.

Diall 50-01: Figure 15A, p. 140, is a typical curve obtained when molding Diall 50-01. Note the general similarity between this curve and the diagram in Fig. 10. Also note the similarity between this curve from Point C to completion of the molding cycle and the punch-travel curves for this material (Fig. 6, Part I). In all of the curves, Point C represents the time at which the indicator mounted on the press showed that the mold had landed.

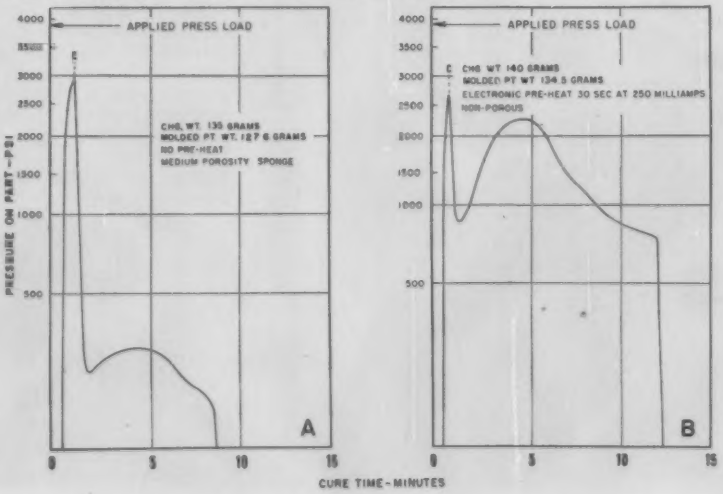
The curve in Fig. 15A indicates a large loss in pressure on the part during the molding cycle. In actual practice, a part of this thickness would usually be molded for about 8 to 10 min. and ejected from the cavity before chemical shrinkage was complete. This part had a comparatively low weight so that the final pressure was low. Curves similar in shape to the second hump of Fig. 15A have been established for a transfer molded, two-step phenolic.[1]

[1] "Internal pressure distribution in molding phenolic test bars," by J. M. Rausch and W. Orvis, SPE Journal *13*, 24 (Jan. 1956).
A complete list of references appeared in Part 1, March issue of MODERN PLASTICS, p. 294.

A second specimen was molded with the same charge weight as that used for the part just described (135 g.), but a much slower close (last 1 in. at 2 in./min.) was used. The curve obtained (Fig. 15B, p. 140) lacks the first hump of Fig. 15A and does not show the same pressure loss on the part.

The absence of the first hump is due to the fact that the pressure did not build up as rapidly

Fig. 18: Pressure curves for Bakelite BM-120



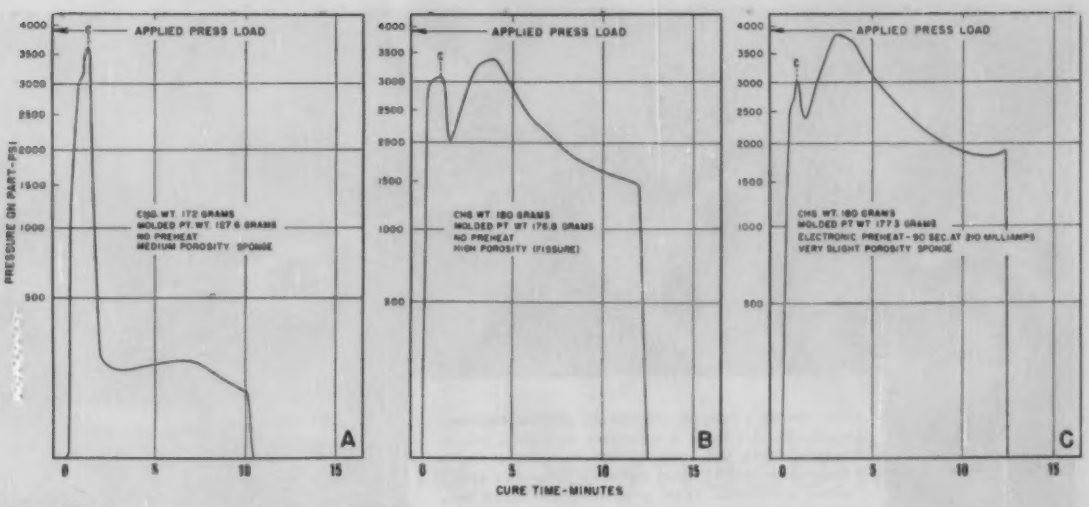


Fig. 19: Pressure curves for Durez 16274

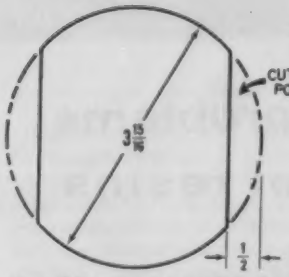


Fig. 20: Templet used for cutting plies of CTL-91LD

because of the slower closing action and because in this longer closing time the flashing material solidified enough so that there was no sudden pressure loss upon landing. The pressure did not drop off to as low a level as that indicated in Fig. 15A, since less material flashed out of the mold and a greater amount was retained in the cavity (134.2 versus 133.2 grams).

When sectioned and polished, each of the above parts showed porosity of the "fissure" type (see Fig. 16, p. 140,) thought to be due to entrapped air. This porosity was avoided in another specimen of this material by preheating it electronically prior to molding and using the slow close mentioned above. The curve for this part is shown in Fig. 15C.

Alkyd 446: With this material, the increased pressure on the part which results from increased charge weight is clearly shown by the pressure curves in Fig. 17, p. 142. Here again, alkyd 446 shows very rapid curing characteristics as it did in the punch-travel work (Fig. 9J, Part I). Porosity which occurred in the part having a low charge weight may be due to the very low pressure attained on the part, since this porosity disappeared in the other two parts.

Point C (the time at which the mold lands) occurs at about the same pressure in each case, but the pressure drop-off immediately after landing decreases at the higher charge weights. It should be noted that although the applied press load is shown as a constant, it actually built up to 25 tons as the press closed. Until the mold landed, the pressure rose along the curve to Point C since the part was carrying the load.

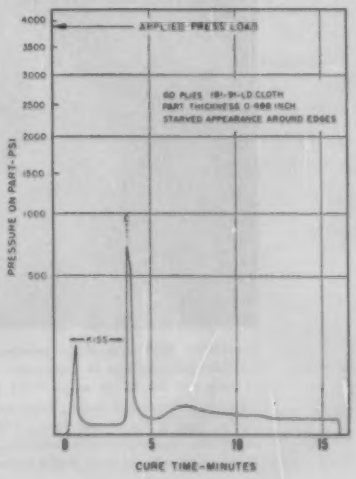
The rate at which this build-up occurs depends upon the rate of compression of the loose material and the rate of extrusion of the material past the punch. After landing, the press load continued to build up to 25 tons, a load that was carried jointly by the part and the lands. The rate at which this final build-up takes place depends upon the design of the hydraulic system. This is true for all of the parts molded.

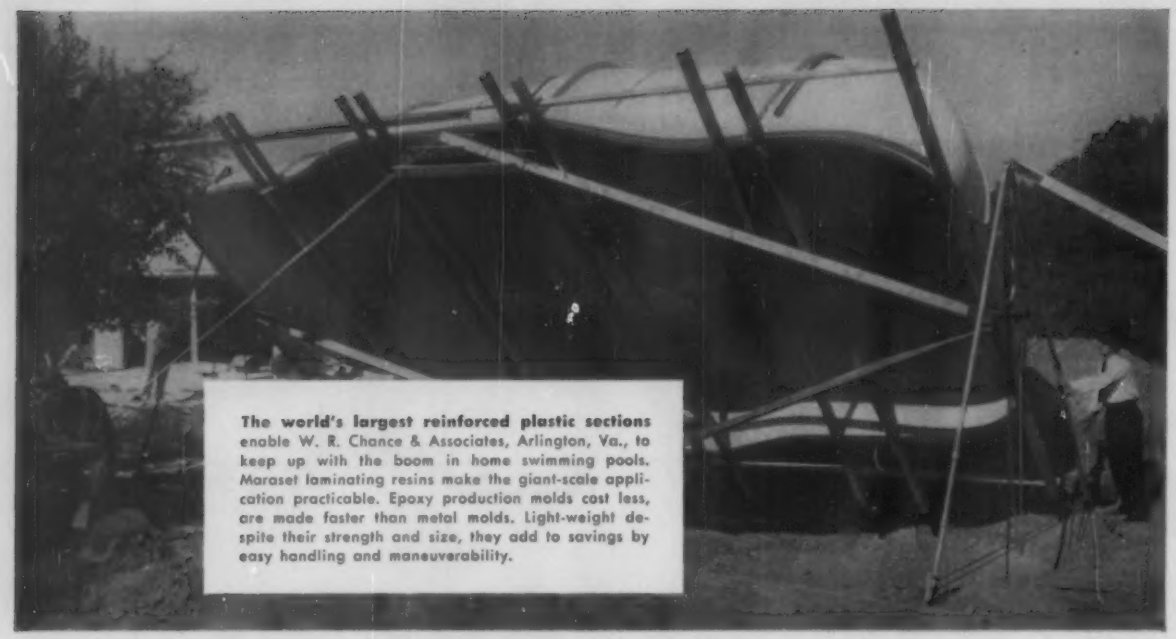
Bakelite BM-120: This commonly used general-purpose molding material has high flow properties as shown by the slow time to land and the large initial pressure loss (Fig. 18A, p. 142). When sectioned and polished, the molded part showed a medium porosity of the "sponge" type (Fig. 16), which is thought to come principally from volatiles generated by the material itself.

A good, non-porous part was obtained by increasing the charge weight and electronically preheating the molding powder prior to molding. The pressure curve for this part (Fig. 18B) shows less flow than before, but has some loss in pressure upon landing. Note the similarity between the second curve and the punch

(*To page* 228)

Fig. 21: Pressure curve for CTL-91LD laminate





The world's largest reinforced plastic sections enable W. R. Chance & Associates, Arlington, Va., to keep up with the boom in home swimming pools. Maraset laminating resins make the giant-scale application practicable. Epoxy production molds cost less, are made faster than metal molds. Light-weight despite their strength and size, they add to savings by easy handling and maneuverability.

Big and small production problems "float away" with Maraset resins

"Stay in the swim"— meet time schedules, outpace competition, develop new applications, speed up and improve manufacturing by using Maraset epoxy and Marblette phenolic resins.

Protection that aids mass production, stops delays is given by Maraset coatings to aluminum mandrels dipped repeatedly into hot liquid to make "fun balls," oxygen masks, and other thin latex products. Seamless Rubber Co., New Haven, Conn., paints the metal forms with abrasion-resistant epoxy resin that seals pores, eliminates sanding, prevents fissures that would blister and deform the rubber.

Plastic tools and dies made from standard and "specially tailored" Marblette formulations create time and labor savings as high as 80%. These versatile resins are durable, light, dimensionally stable, readily recast for design changes.

Protection for surfaces and finishes of many materials is assured by Maraset maintenance paint and varnish. These coating resins resist heat, humidity, abrasion, chemicals and corrosives.

Encapsulating and impregnating Maraset compounds offer high dielectric strength. They adhere firmly to electronic parts, cure quickly, provide a hermetic seal, guard against shock, heat, moisture, and contaminants.

FREE — new technical bulletins on Maraset resins for casting, laminating, potting, surfacing, and other uses. Practical aid based on three decades of Marblette research can help solve your production requirements.

Write, wire or phone today:

Marblette

37-17 Thirtieth St., Long Island City 1, N. Y.
Telephone STillwell 4-8100

CHICAGO • DETROIT • LOS ANGELES
WICHITA • TORONTO • ROCHESTER, N. Y.

Plastics Technical Section

Dr. Gordon M. Kline, Technical Editor

Theoretical study of polyethylene permeability

By Jules Pinsky†

The factors involved in polyethylene permeability have been theoretically determined. Problems of thermo-dynamics, physical chemistry, and physics were intricately involved with available commercial polyethylenes as well as experimental polyethylenes. This present paper is an attempt to bridge the gap between the theoretical chemist and the practicing engineer, so that practical application of this theory can be made. Polyethylene, in its rapid progression to a position as the first billion-lb./year plastic, is used in film and bottle form in such a manner that its permeability characteristics are of prime importance.

To understand the theory of permeability, a first requisite is a set of permeability test results. The structure for this permeability theory was built on the effects of 80 chemicals studied in the Plax Laboratory over a period of 10 years on three available commercial polyethylenes, two experimental polyethylenes, and an irradiated commercial polyethylene. The chemicals studied include inorganic acids, alkalies, organic acids, alcohols, polyhydric alcohols, esters, ethers, aldehydes, ketones, anhydrides, terpenes, nitrogen-containing compounds, aliphatic hydrocarbons, aromatic hydrocarbons, chlorinated hydrocarbons, and miscellaneous chemicals, including water.

The polyethylene was in the form of Plax blow molded 4-oz. Boston Round bottles. These bottles were filled to shoulder level and conditioned at temperatures of 32, 70, 100, 130, and 165° F. for storage periods of 1 yr., unless product or container condition made lesser times imperative or advisable. The bottles were run in quintuplicate, with weight losses checked after intervals of 1, 5, and 10 days, 1, 3, 6, and 9 mo., and 1 year.

From these data the P-factors were obtained by averaging the weight losses for the five specimens run at each temperature, plotting them against time, and measuring the slope for equilibrium permeability. The P-factor thus obtained provided the rate at which the particular material passed through polyethylene, expressed in terms of grams of permeant/24 hr./1 mil polyethylene film thickness/100 sq. in. area.

Changes in the chemicals were checked by titration and refractive index determinations; other changes such as color, odor, etc., were noted, while the polyethylene bottles were examined for physical property deterioration, if any.

This accounts for the background data upon which the theoretical assumptions are based. A list of symbols to be used in this discussion is given in Table I on the following page.

Permeability has been found in various investigations to be dependent upon several factors of which solubility, diffusion, and temperature are important factors. For a constant temperature, permeability is frequently expressed as

$$P = DS/d \qquad \text{Eq. 1}$$

where d = x thickness.

When d = 1

$$P = DS \qquad \text{Eq. 2}$$

It is an experimental fact that the coefficient of permeability as well as those of diffusion and

*Reg. U. S. Pat. Off.

†Chief physicist, Plax Corp.

Based on a report entitled "Theoretical Investigation of the Mechanism of Transfer of Materials Through Polyethylene," by Henry A. Bent and Jules Pinsky. This investigation was conducted by Plax Corp. under the authority of the Materials Laboratory Contract AF33(616)-112 RDO 618-11 from Wright Air Development Command, U. S. A. F., Wright Patterson Air Force Base. The report is part 2 of a three-part study.

Table I: List of symbols

Symbol	*Definition*
P	Permeability, weight/unit time/unit thickness/unit area
D	Diffusion, weight/unit time/unit thickness/unit area
S	Solubility, weight/unit weight plastic
P_o	Constant for given system
D_o	" " " "
S_o	" " " "
E_p	" " " "
E_d	" " " "
E_s	" " " "
R	Universal gas constant (1.987 calories/°Kelvin /mole)
T	Absolute temperature, °Kelvin
ΔΔH	Measure of polarity
ΔH	Heat of vaporization, kcal./mole
V	Molar volume, cc. at room temperature = gram mol. wt./density
L	Length of Taylor-Hirschfelder-Fisher molecular model

solubility are often well represented by the following equations:

$$P = P_o e^{-E_p/RT} \qquad \text{Eq. 3}$$

$$D = D_o e^{-E_d/RT} \qquad \text{Eq. 4}$$

$$S = S_o e^{-E_s/RT} \qquad \text{Eq. 5}$$

to express their dependence on temperature. *P*, *D*, and *S* are permeability, diffusion, and solubility expressed in grams/24 hr./0.001 in./100 sq. in. of polyethylene, unless otherwise stated. P_o, D_o, S_o, E_p, E_d, and E_s are constants for a given substance. *R* is the universal gas constant equal to 1.987 calories/° K./mole, and *T* is the absolute temperature in ° K.

In this study *P* ranged all the way from very small values (less than 0.02) for several of the hydrogen-bonded compounds at 32° F. to almost immeasurably large values for many of the hydrocarbons at 165° F. (more than 21,000 for chlorobenzene at this latter temperature!), altogether, over a million-fold variation in the P-factor.

Temperature dependence of "P"

To check the exponential dependence of *P* upon the inverse of the absolute temperature and to evaluate the parameters P_o and E_p, equation 3 is rewritten as

$$\log P = -(E_p/2.3R)\,(1/T) + \log P_o \qquad \text{Eq. 6}$$

showing that a plot of the common logarithm of *P* against the reciprocal of the absolute temperature should be a straight line with a slope of $-E_p/2.3R$) and an intercept at $1/T = 0$ of $\log P_o$. This has been done and the resultant plot appears as shown in Fig. 1, below.

The first step then in the reduction of the data is the construction of log P versus 1/T plots as shown in Figure 1. From these the parameters P_o and E_p are determined and compared. Particular attention is given E_p since it is this so-called "activation energy" that determines the temperature variation of the P-factor. Furthermore, knowing E_p it is possible sometimes to estimate good values for log P_o and hence for the P-factor itself.

Thus the accuracy of the log P versus 1/T plots is of paramount importance in this study, for the reliability of all subsequent calculations rests squarely upon the validity of these plots and the slopes and intercepts obtained from them.

As a liquid diffuses out of a bottle initially filled to the neck, the observed P-factor, which is always a composite of the liquid and vapor transmission rates, will generally decrease with time, because that part of the air gap in contact with the bottle can never be completely saturated with vapor if the outside of the bottle is "dry." Hence the vapor-phase transmission rate will generally be somewhat less than the liquid-phase transmission rate, and the former becomes increasingly important as the bottle tends toward emptiness, causing the observed, instantaneous P-factor to decrease with time. (However, when collapse occurs, this "tailing off" effect, which must necessarily set in, sometimes may be delayed until the bottle is almost completely "empty.")

For example, Fig. 2, p. 148, shows the behavior of a bottle initially filled with 100 g. of ethyl acetate and kept for nearly 2 wk. at 165° F.

The slope of the solid line in Fig. 2 represents a P-factor of 1990, that of the broken line 1700. It is the former, which represents the initial P-factor after steady-state has been established, that is of interest. With this in mind, many of the observed P-factors were revised.

These revisions resulted in a general improvement in the overall appearance of the data when the logarithms of the observed P-factors were plotted against 1/T.

It should perhaps be noted, however, that such revisions as have been made do not improve

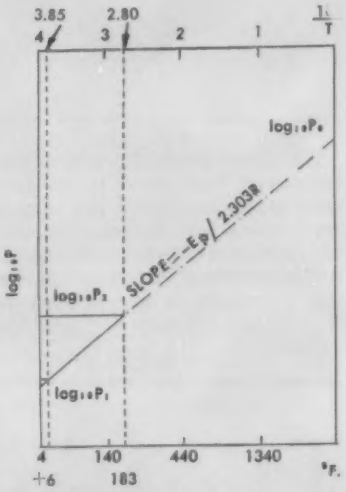
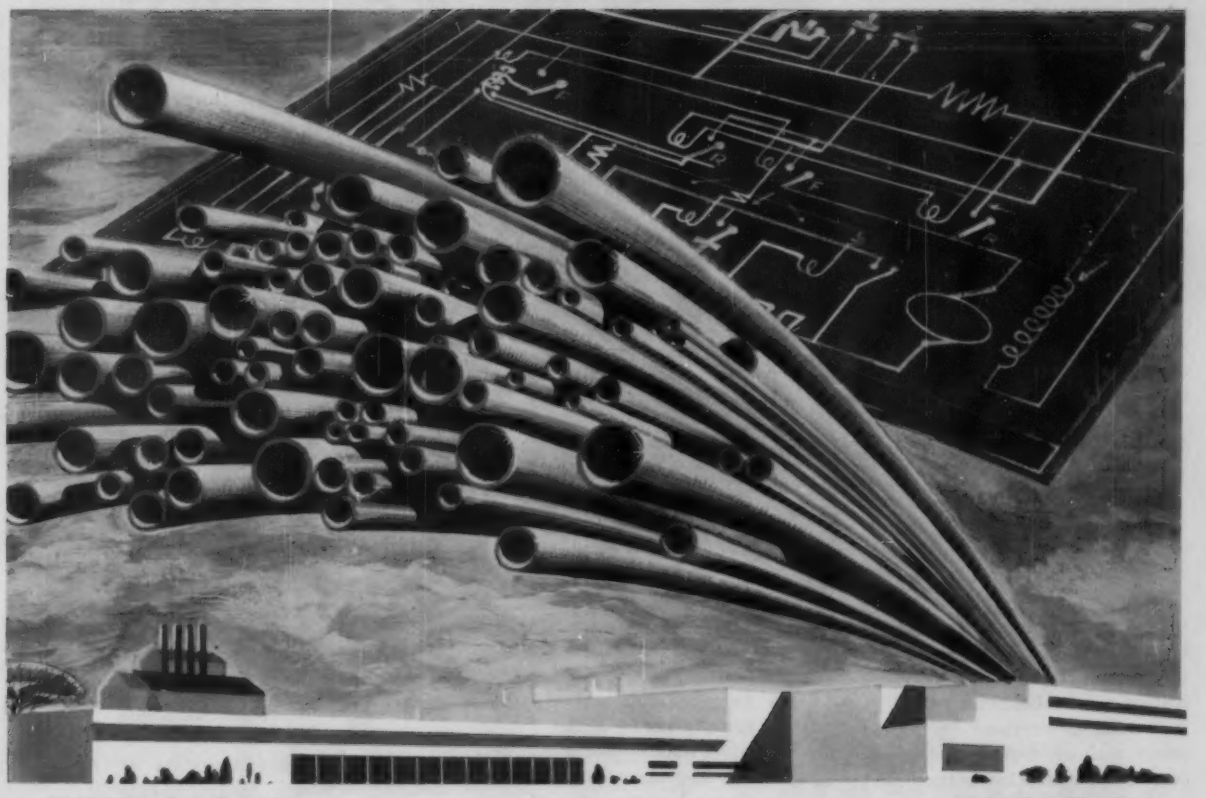


Fig. 1: Dependence of $\log_{10}P$ upon 1/T

the ability to predict yearly losses—at least, not at this point. In fact, as already observed, in the case of ethyl acetate at 165° F. the bottles are essentially empty after 14 days, which makes the yearly loss the same as the 14-day loss.

Finally, with regard to this reduction of the data, it should be noted that, particularly at 32° F., most of the slow (and hygroscopic) solvents exhibited either initial increases in weight or else relatively small P-factors at the start. Probably this is just a matter of the degree to which the moisture in the air permeates inward at the start. The effect has been observed to be most pro-

Naugatuck KRALASTIC



MATERIALS 24% LESS

LABOR 62% LESS

KRALASTIC electric conduit cuts costs 51%

15,060 feet of AMCO PLASTIC CONDUIT* were laid in ditches and covered with 53 yards of concrete in 116 man-hours.

Extruded of lightweight KRALASTIC®, Amco Pipe made it possible for one man to carry on his shoulder, and distribute, as much as 1,000 feet of 1½" conduit... eliminating the need for handling equipment. After laying all 24 lines in a ditch, one man could solvent weld every connection in 20 minutes... eliminating making and connecting threaded assemblies.

Naugatuck's KRALASTIC is an unusual rubber-resin blend. And because its properties are far superior to wood, metal and other plastics, KRALASTIC offers practically unlimited possibilities. For more about this tough, durable plastic material, and the advantages it offers you, write to us on your company letterhead TODAY.

*Extruded of KRALASTIC by AMCO PLASTIC PIPE COMPANY, San Leandro, California

United States Rubber

Naugatuck Chemical Division

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Gastonia, N. C. • Chicago • Los Angeles • Memphis • New York • Phila.
IN CANADA: Naugatuck Chemicals, Elmira, Ontario • Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N. Y.

nounced in the case of the 93% sulfuric acid.

Table II, p. 150, presents the data for 40 typical materials whose permeability behavior is important for our theoretical discussion.

The master plot and its uses

The data in Table II are plotted on semi-log paper with the resultant curve shown as the master plot, Fig. 3, p. 155. This plot can be employed in many useful ways:

1) It serves as a proof of the overall consistency of the data, since the points fall very nearly on straight lines.

2) These plots can be used to "smooth" data that exhibit slight variations from linearity.

3) Measured results in the room-temperature range can be extrapolated upwards and downwards into experimentally difficult or inconvenient-to-measure regions. For example, for the alcohols and similar substances, which showed weight increases and/or erratic behavior at 32° F., it can be determined by extrapolating down from higher temperatures where hygroscopic effects were negligible what the P-factors probably would have been if the relative humidity had been zero both in the 32° F. "oven" and during weighing. Or, it can be stated confidently that the P-factor for *n*-heptane at −40° F. and zero relative humidity is 0.73. This is not immediately obvious from the data alone.

4) Accurate interpolation with these plots is possible. Thus, the P-factor for *n*-heptane at 85° F. is 500.

5) It is possible to interpolate with respect to members of a homologous series. For example, the P-factor for *n*-octane at 130° F. is undoubtedly within a few percent of 2000. With this master plot, the P-factor can probably be reliably estimated for hundreds, perhaps even thousands, of similar compounds. It is important, though, to classify a compound according to its dominant functional group. Thus, for example, the diacetone alcohol, $CH_3COCH_2COH(CH_3)_2$, belongs with the alcohols rather than the ketones, as would be the case if the hydroxyl group, which takes precedence over all others studied, were absent. Also, it should be noted that chlorine has no drastic effect upon P-factors, behaving in this respect very much like a methyl group. This is somewhat of an over-simplification, but it points up that chlorobenzene has permeability characteristics similar to benzene itself, p-chlorotoluene to p-xylene, and chloroacetic acid to acetic acid.

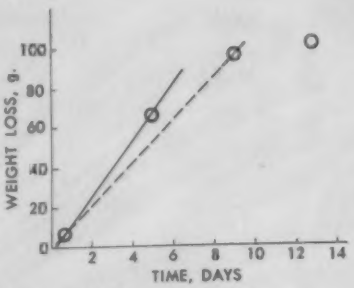


Fig. 2: Diffusion of ethyl acetate at 165° F. (Initial net content 100 g.)

From this master plot it can be seen that the chemical families group themselves in order of increasing P-factors as follows:

Alcohols
Acids
Nitro derivatives
Aldehydes
Ketones
Esters
Ethers
Hydrocarbons

Polyethylene in its early days was regarded as a completely linear, regular, non-polar molecule. Today, as more and more is developed as to its degree of side branching, its crystallinity, its molecular weight, etc., the more it is realized that there is no adequate theoretical explanation for even its more simple physical properties.

Furthermore, the permeants used in this study cannot be accurately defined in theoretical terms, for the liquid state is not completely understood even for substances as simple as liquid argon. Therefore, a theoretical study of the interaction of polyethylene with organic permeants becomes a complex problem in statistical thermodynamics and diffusion theory. It has not yet been possible to solve a problem of this type, even when dealing with the simplest possible constituents.

It is gratifying and interesting, therefore, that it was possible to study the Plax-assembled data, and draw from them a rather large number of significant conclusions concerning the permeability of polyethylene to organic solvents.

In a report of this brevity, it is possible only to summarize these conclusions, remembering that their justification and delineation of the exact conditions under which these conclusions are valid were established by the elaborate data determined from the pragmatic testing.

Conclusions

1) Permeability is a function of diffusion and solubility

$$P = DS$$

2) Solubility (S) is usually a much more important influence than diffusion (D).

3) Swelling measurements or weight increase measurements can establish the order of *S*. This *S* has proved to coincide precisely with the order of observed values of *P*.

4) The solubility coefficient *S* (of the permeants in polyethylene) follows the expected rule that "like dissolves like." Thus non-polar liquids are dissolved more readily in non-polar polyethylene.

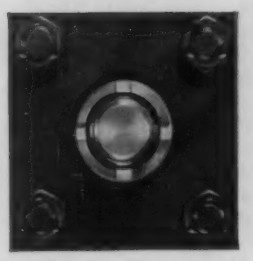
5) The parallelism of *S* with *P* allows us also to say at this time that "like permeates through like."

6) Polyethylene is considered a non-polar material. It is natural, therefore, that as the polarity of the permeant increases, that of the P-factor decreases concommittantly.

7) Polarity of a permeant can be measured in a number of different ways:

A. Qualitatively it can be determined by

1. Dunkel's group contributions to heat of vaporization—Kilocalories mole (ΔH) or



Here are the world's finest power cylinders

...competitively priced!

This ad is written for the man who has thought all cylinders are "pretty much alike." That just isn't so, and your Hannifin man would like an opportunity to show you why...

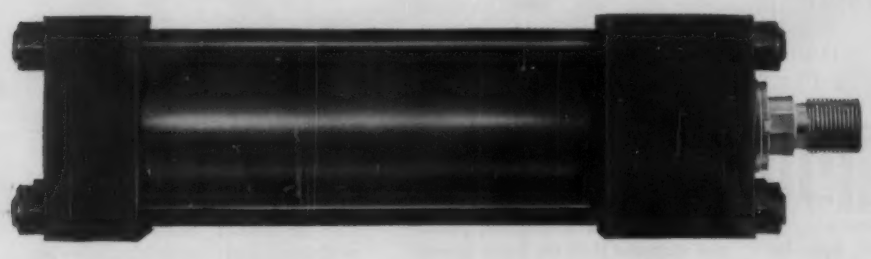
He'll show you design features that other cylinders simply do not have... extra quality workmanship at critical points that pays off in longer life ...accessibility that simplifies their infrequent maintenance. And when he talks price and delivery, you will find these better features cost you no more, can often be delivered sooner.

We think you'll agree that it pays to standardize on Hannifin cylinders.

AIR AND HYDRAULIC

HANNIFIN

POWER CYLINDERS



COMPLETE CYLINDER FILE

Write for your copy of this new Hannifin Cylinder File . . . complete, easy-to-use, easy-to-order-from information on five lines of Hannifin Cylinders. Write Hannifin Corporation, 501 S. Wolf Road, Des Plaines, Ill.

Table II: Measured permeability of polyethylene to 40 chemicals at 32, 70, 100, 130, and 165° F.

Chemical	Permeability (g./24 hr./0.001 in./100 sq. in.) 32° F.	70° F.	100° F.	130° F.	165° F.
Formic acid	0.251	0.666	2.790	12.0	51.6
Acetic acid	0.351	3.080	13.55	66.0	304.0
n-Butyric acid	0.193	4.79	29.6	...	579.0
Benzoic acid	...	0.067	0.570	5.67	35.9
Methyl alcohol	0.253	1.22	5.35	27.8	...
n-Propyl alcohol	0.072	0.495	2.89	22.4	168.0
Allyl alcohol	0.161	0.65	4.06	23.0	137.8
n-Butyl alcohol	...	0.462	3.12	20.4	164.
sec-Butyl alcohol	...	0.619	5.24	37.9	280.
tert-Butyl alcohol	...	0.260	2.44	27.5	236.5
n-Octyl alcohol	...	0.498	3.31	25.6	188.5
Phenol	...	0.484	3.28	24.0	119.0
Ethylene glycol butyl ether	...	0.666	4.40	34.9	231.
Ethyl acetate	1.903	16.55	83.3	378.	1990.
Amyl acetate	0.566	8.70	37.7	269.	1300.
Dibutyl phthalate	...	...	0.81	5.7	27.75
Diethyl ether	48.0	313.0	...	...	...
Dibutyl ether	...	...	407.	1480.	4890.
Butyraldehyde	0.890	10.13	66.1	339.	...
Benzaldehyde	0.369	6.80	32.85	206.5	1060.
Acetone	1.38	6.75	32.45	184.	...
Methyl ethyl ketone	3.67	12.6	60.0	326.5	1401.
Diacetone alcohol	...	0.308	1.96	15.0	92.5
Acetic anhydride	...	0.809	4.145	29.65	150.
Nitroethane	0.968	2.71	11.4	61.3	290.
n-Pentane	96.9	526.0	...	...	...
iso-Pentane	47.8	270.0	...	...	...
Pentene-2	180.	695.0	...	...	...
n-Heptane	48.6	269.5	929.	2650.	8160.
Decane	9.49	71.2	297.	1220.	4120.
Tetradecane	1.74	15.6	89.6	404.	...
Benzene	50.5	440.	1585.	4480.	13670.
Ortho-xylene	36.1	284.0	1167.	4270.	16600.
Para-xylene	87.3	505.	1760.	4760.	16320.
Cyclohexane	31.6	281.	1223.	3730.	...
Chlorobenzene	76.4	500.	1630.	5980.	21150.
p-Chlorotoluene	37.0	332.	1357.	4670.	18520.
Dipentene	15.0	128.	501.	2030.	8110.
Monochloroacetic acid	...	0.31	1.82	15.	59.9
Water	...	0.279	0.835	3.94	18.4

2. The cohesive energy density of the permeant.

B. Quantitatively it can be measured by

1. The polarity index ($\Delta\Delta H$) as determined from experimental heats of vaporization, or

2. The Flory - Huggins polymer interaction parameter as measured by swelling equilibrium.

The two quantitative methods mentioned above have been found to be good indices of polarity for the polyethylene-organic permeant systems that we have investigated.

8) The polarity index ($\Delta\Delta H$) and the temperature variation of the Flory-Huggins parameter were found to closely correlate.

9) An oxygen atom may often be the seat of polarity in a molecule. The type of linkage is, however, very important to distinguish.

10) Using the methods outlined in 7B, we find that the highest polarity is found in the acid (—COOH) group, then the hydroxyl (—OH) group, both of which can be hydrogen bonded (but which has little effect on $\Delta\Delta H$); the next highest polarity is for the carbonyl (C = O) group and the lowest polarity is found in the ether (C-O-C) linkage.

11) This was substantiated by the permeability data in that the acids and alcohols were the most polar and least permeant of all the materials studied. The esters and ketones were in a more permeant bracket, and the ethers among the most permeant.

12) There are, of course, exceptions to this general rule. The carboxylic acids are more permeable than one would predict from their polarity index, which indicates a considerably lower index than corresponding alcohols. This is probably due to the greater ease of diffusion for the dimers, which diffuse more readily than the more polar, smaller monomers.

13) The explanation for this apparently anomalous behavior lies in the effect of the carboxylic dimers which have been found to be present in polyethylene.

14) The presence of dimers also explains why the heat of solution of the permeant in the polymer is significantly less than the polarity index ($\Delta\Delta H$).

15) As a rule, however, any hydrogen-bonded permeant will have a very low permeability factor.

16) It appears that with the higher aliphatic compounds there is an internal shielding effect on polarity, which tends to increase S, and thus P, a small amount.

17) The effect of this internal shielding is sufficient to explain why the order of S is a reverse of E_p (activation energy, kcal./mole) for permeant family members within a single homologous series. This holds for all except the extreme cases of the hydrocarbons and the alcohols, which can be explained.

18) The presence of a crystalline phase (approximately 58% for the polymers studied explains the limited swelling and solubility that polyethylene shows in even the most potent solvents at room

(To page 155)

The "Coffee Master's" phenolic rim is odorless, imparts

The Sunbeam "Coffee Master" has parts made of two BAKELITE Phenolics – general-purpose BMG-5000 and chemical-resistant BMG-2095.

Phenolics

. . . too useful to be outmoded

You've seen phenolics around so long because they have so much to offer. These thrifty plastics thrive on new ideas, keep active on new jobs. One reason for this is their adaptability. They cover a wide range of needs. There are five different categories of BAKELITE Brand Phenolics, made up of dozens of compounds. Among them, you may well find the one with the ideal combination of properties for your product, whether it's well established or still in the planning stage. How long has it been since you looked at them? As a start, glance over the information on the next two pages.

The "Coffee Master's" phenolic rim is odorless, imparts no taste, and is unaffected by moisture or hot vapor. Chicago Molded Products Corp. used BMG-2095.

BMG-2095 . . . *a chemical-resistant phenolic*

This premium chemical-resistant molding material is also useful where moisture resistance, non-toxicity, and minimum odor are necessary.

It is a one-step, cellulose-filled phenolic with good molding latitude, fast set-up, and good mold release.

Dimensional stability is a notable property of BMG-2095. Surface appearance is excellent. Pieces molded from it will not bleed in most organic solvents. As a result, this material is useful for both industrial and consumer applications.

Handles, base, and switch for the Sunbeam "Coffee Master" were molded of BMG-5000 by Chicago Molded Products Corp.

BMG-5000 . . . *a general-purpose phenolic*

BMG-5000—the outstanding development in phenolics by Bakelite Company—is a truly general-purpose material, matching production efficiency with the broadest possible range of applications.

This means economy. BMG-5000, engineered for the best combination of curing speed and molding latitude, assures minimum down-time. It provides rapid set-up and easy release from mold cavity plungers and followers. Its lower specific gravity increases molded items per pound.

BMG-5000 is suitable for compression, plunger, or transfer molding. Products are rigid at hot discharge, can be released from the mold quickly and easily. An exceptional surface appearance results from the uniform shrinkage and absence of warpage and blisters.

TYPICAL PROPERTIES

Values relating to Fabrication	General-Purpose BMG-5000	Electrical-Resistant BMG-0750	Heat-Resistant BMG-8335	Impact-Resistant BMG-2080	Chemical-Resistant BMG-2095
Granulation (D392-38)	16 mesh	16 mesh	12 mesh	6 mesh	16 mesh
Bulk Factor (D392-38)	2.4	2.2	2.1	3.0	2.6
Plasticity Grades Available	4, 6, 9, 12, 15, 18	6, 9, 12, 15	6, 9, 12, 15	9, 12, 15, 18	4, 6, 9, 12, 15
Molding Shrinkage, in./in. (D955-51)	0.005	0.004	0.004	0.006	0.006
Values from Electrical Tests					
Dielectric Strength (D149-55T) Short time, volts/mil	370	385	150	280	225
Volume Resistivity, ohm-cm. (D257-54T)	1×10^{13}	1×10^{13}	5×10^{11}	1×10^{13}	1×10^{13}
	60 c. 1 kc. 1 mc.	60 c. 1 kc. 1 mc.	60 c. 1 kc. 1 mc.	60 c. 1 kc. 1 mc.	60 c. 1 kc. 1 mc.
Dielectric Constant (D150-54T)	5.7 5.3 4.6	4.9 4.7 4.5	20.0 13.0 8.0	11.0 8.0 6.0	22.0 13.0 7.0
Dissipation Factor (D150-54T)	0.07 0.04 0.03	0.020 0.018 0.008	0.25 0.20 0.08	0.21 0.16 0.05	0.30 0.25 0.06
Values from Mechanical Tests					
Izod Impact Strength (D256-54T) ft-lb/inch of notch	0.30	0.34	0.30	0.48	0.25
Compressive Strength (D695-54), psi	34,000	25,000	28,000	28,000	34,000
Tensile Strength (D651-48) (⅛ in.), psi	8400	7000	5000	7500	7000
Flexural Strength (D790-49T), psi	10,000	9500	7000	9000	7500
Modulus of Elasticity in Flexure (D790-49T), psi	10×10^3	22×10^3	12×10^3	8.5×10^3	8×10^3
Values from Miscellaneous Tests					
Molded Specific Gravity (D392-38)	1.34 Black 25 1.36 Brown 15	1.72	1.58	1.37	1.37
Heat Distortion Temp., deg. F. (D648-45T) (½ in—264 psi)	330	285	340	315	340
Moisture Sensitivity:					
Water Absorption (D570-54T), per cent wt. gain	0.45	0.03	0.2	0.4	0.4
Saturation Constant, per cent	8	1.1	3	4.8	3.5
Diffusion Constant, $cm^2/hr.$	1.3×10^{-5}	1×10^{-5}	1.5×10^{-5}	3×10^{-5}	7×10^{-5}

Bakelite Company has numerous phenolic compounds in other special categories as typified by:

BMG-0750 . . . *exceptional electrical resistance*

Combines excellent electrical and fabricating properties. BMG-0750 meets requirements of Govt. Spec. MIL-M-14E.

Its dimensional stability is excellent—an important property where close tolerances must be held. Its moisture resistance equips BMG-0750 for further success in electrical applications. Most of them—vacuum tube bases, coil forms, capacitor housings, and resistors, for example—make use of both these factors. In molding, BMG-0750 demonstrates exceptionally fast set-up. It has lower "fines" content, better mold release, and less tendency to gassing. Improved molding characteristics make it suitable for either compression or transfer molding.

For information and assistance in applying these or other BAKELITE Brand Phenolic Plastics to your product, write Dept. WQ-104.

BMG-8335 . . . *superior heat resistance*

For long periods of time, BMG-8335 will withstand temperatures as high as 400 deg. F., even as much as 500 deg. F. for shorter periods.

Pieces molded from it have an exceptional gloss that is retained even after exposure to high temperatures. Color retention is also excellent. Consequently, BMG-8335 is widely used for utensil handles and heating appliance components. This mineral-filled two-step phenolic has a relatively low specific gravity. More items can be molded per pound. Finished pieces are compact and light-weight. In addition, they are resistant to wear and abrasion and are dimensionally stable.

BMG-2080 . . . *high impact resistance*

While the impact resistance of this material is its primary feature, BMG-2080 balances this property with a number of others that are important.

Even at elevated temperatures, BMG-2080 displays superior resistance to moisture, soap, and detergents. It performs extremely well where one side of the molding is wet while the other remains dry. It is widely used for pump housings, valve bodies, fill tubes, aspirators, washing machine agitators, sterilizers, and dispensers. As a one-step material, BMG-2080 also offers several advantages in the molding process, notably minimum odor and a rapid rate of cure.

BAKELITE BRAND PLASTICS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

The term BAKELITE and the Trefoil symbol are registered trade-marks of U.C.C.

In Canada: Bakelite Company, A Division of Union Carbide Canada Limited, Belleville, Ontario.

absence of warpage and blisters.

no wrong numbers here . . .

FLEXOL PLASTICIZERS DOP, 426, 810, 10-10, and CC-55

Trade-Mark

Each one has its place in plastics, and each one rates a listing on your books. These phthalates offer excellent heat and light stability, good resistance to water extraction, and excellent electrical properties. In addition, these five FLEXOL Plasticizers allow you to select the phthalate with the proper volatility, solvent power, and dispersing action for your use. Check these phthalates before you consider any other plasticizer for your vinyl plastics or nitrocellulose lacquers.

CARBIDE AND CARBON CHEMICALS

Carbide and Carbon Chemicals Company
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

FLEXOL Plasticizer DOP (di(2-ethylhexyl) phthalate)—the "standard" plasticizer for vinyls for more than ten years.

FLEXOL Plasticizer 426 (a mixed alcohol phthalate) saves you money and offers quality, too.

FLEXOL Plasticizer 810 (a higher alcohol phthalate) is outstanding for its low volatility and the improved low-temperature properties it imparts to vinyls. Plastisols made with 810 have excellent viscosity stability.

FLEXOL Plasticizer 10-10 (didecyl phthalate) is the least volatile of phthalate plasticizers—it has good electrical properties and is a good dispersant, too.

FLEXOL Plasticizer CC-55 (di(2-ethylhexyl) hexahydrophthalate) is an excellent dispersant for vinyl plastisols with stable, low viscosities.

To be sure you have the right phthalate every time, call or write the nearest CARBIDE office. In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Toronto.

The term "Flexol" is a registered trade-mark of Union Carbide and Carbon Corporation

The term BAKELITE and the Trefoil symbol are registered trade-marks of U.C.C.
In Canada: Bakelite Company, A Division of Union Carbide Canada Limited, Belleville, Ontario.

temperature. A completely amorphous polyethylene would dissolve in most hydrocarbons at room temperature.

19) The presence of both the crystalline and amorphous states in polyethylene produces an "anti-freeze effect." This phenomenon seriously complicates the quantitative development of the theory of permeability.

20) It is generally assumed that the permeants do not penetrate the crystalline regions in the polyethylene material.

21) However, solubility is not the complete governing factor in permeability, as witnessed by:

A. The rate of increase of permeability (P) with temperature is much more rapid than the increase of solubility (S).

B. For all materials tested, the activation energy for permeability in kcal./mole (E_p) was always greater than 12, whereas the activation energy for solubility (E_s) was always less than 5.

C. Solubility is not very dependent on molecular geometry, but permeability is very definitely so dependent.

D. The effect of polarity has an influence beyond solubility.

22) Permeability of polyethylene to organic solvents can best be expressed mathematically as:

$$P = P_0 e^{-E_p/RT}$$

23) Among other usages, as previously stated, the master plot of log P versus 1/T has been found a means to:

A. Establish the parameters E_p and P_o.

B. Check over-all consistency of experimental data.

C. Smooth slight discrepancies in experimental measurements.

D. Extrapolate the experimental data.

E. Interpolate with the experimental data for:

1. Various temperatures for a compound.

2. Various compounds at a given temperature.

24) The molecular size and shape of the permeant affect *P* primarily as a function of the kinetic factor *D*.

25) In order to establish indices, the molar volume is taken as the index of size; the molar

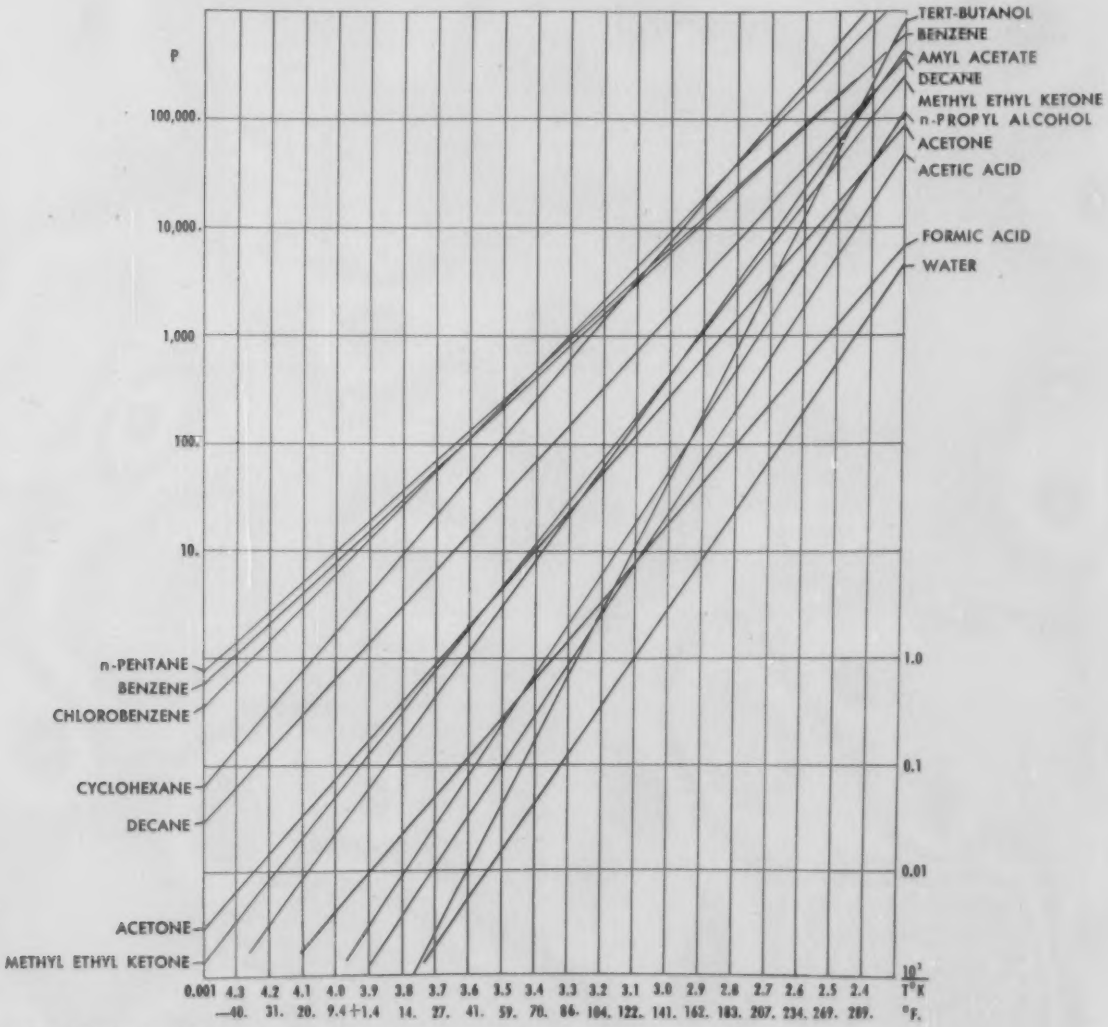


Fig. 3: Master plot of *P* versus 1/T

volume divided by the length of the corresponding Fisher-Hirschfelder-Taylor molecular model is the index of shape.

26) P also depends significantly on the polarity index ($\Delta\Delta H$).

27) We have found quantitatively that:

A. E_p increases 0.0348 kcal./mole per cc. of molar volume.

B. E_p increases 0.75 kcal./mole per unit increase in the shape factor V/L.

C. E_p increases 2.4 kcal./mole per kcal. of polarity as measured by $\Delta\Delta H$.

D. In summation:

$$E_p = 0.0348V + 0.75\,V/L = 2.4\,\Delta\Delta H.$$

28) There are special cases where a correction factor for 27D is necessary:

A. Subtract 1 for para-substituted compounds

B. Subtract 2 for alcohols

C. Add 3 for aldehydes

29) E_p is more important than P_o in determining room temperature values.

30) Thus, from the master plot, information can be obtained from

A. Measured data, or

B. Completely calculated from theory as follows:

1. A single P-factor measurement at any temperature is sufficient to serve as a base point for permeability calculation at any temperature.

2. From E_p, which can be calculated, we can determine the P-factor for any material at any temperature. To elaborate, for any permeant, once density, molecular weight, model length, and heat of vaporization is found, an absolute P-factor can be determined.

Table III: Prediction of permeability factors at 70° F. for the diffusion of organic solvents through polyethylene.

Chemical	E_p^{calc} [a]	$\log P_o$ [b]	$P^{calc.}_{70°F.}$	$P^{obs.}_{70°F.}$	$P^{calc.}_{70°F.}/P^{obs.}_{70°F.}$
n-Octanol	22.8	16.49	0.347	0.50	0.69
tert-Butanol	24.2	17.51	0.324	0.26	1.24
sec-Butanol	22.7	16.62	0.54	0.60	0.88
n-Butanol	22.4	16.40	0.57	0.46	1.25
n-Propanol	22.4	16.40	0.57	0.40	1.44
Phenol	20.9	15.38	0.72	0.48	1.44
Butyraldehyde	19.0	15.10	9.77	10.13	0.87
Benzaldehyde	19.2	15.20	8.71	6.80	1.28
Acetone	18.3	14.75	14.8	6.75	2.19
Methyl ethyl ketone	18.3	14.76	14.8	12.6	1.16
Ethyl acetate	18.1	14.66	16.6	17.0	0.98
Amyl acetate	19.5	15.35	7.41	8.30	0.89
Dibutyl ether	16.3	13.80	49.	88.	0.55
Pentane	13.0	12.22	371.	526.	0.70
Heptane	14.0	12.68	190.	270.	0.70
Decane	15.7	13.50	69.2	71.2	0.97
Tetradecane	18.0	14.60	17.0	17.0	1.00
Benzene	13.3	12.52	436.	440.	0.99
o-Xylene	16.0	14.38	316.	290.	1.09
p-Xylene	13.6	12.73	427.	500.	0.85
Chlorobenzene	14.3	13.22	398.	500.	0.79
p-Chlorotoluene	16.2	14.51	302.	300.	1.01
Cyclohexane	16.8	14.93	282.	285.	0.99
Dipentene	15.9	13.95	138.	128.	1.08

[a] E_p expressed as kcal./mole
[b] P = g./24 hr./0.001 in./100 sq. in.

Calculations of P-factors

As a demonstration of the value of the equation

$$P = P_{oe}^{-Ep/RT}$$

the calculated versus the observed P-factors are presented in Table III, above. Three sample calculations of P-factor using this equation follow:

n-Octanol:

$P = P_{oe}^{-E_p/RT}$ or

$$\begin{aligned}\log P &= -E_p/RT + \log P_o \\ &= -22.8/(2.3\times1.987\times10^{-3}\times294) \\ &\quad +16.49 \\ &= -22.8/(1.345)+16.49 \\ &= -16.95+16.49 \\ &= -.46 \text{ or } 9.54-10\end{aligned}$$

$P = 0.347$ g./24 hr./0.001 in./100 in.^{2}

Tetradecane:

$$\begin{aligned}\log P &= -E_p/RT + \log P_o \\ &= -18.0/(2.3\times1.987\times10^{-3}\times294) \\ &\quad +14.60 \\ &= -18.0/(1.345)+14.60 \\ &= -13.37+14.60 \\ &= 1.23\end{aligned}$$

$P = 17.0$ g./24 hr./0.001 in./100 in.^{2}

Benzene:

$$\begin{aligned}\log P &= -E_p/RT + \log P_o \\ &= -13.3/(2.3\times1.987\times10^{-3}\times294) \\ &\quad +12.52 \\ &\quad -13.3/(1.345)+12.52 \\ &= -9.88+12.52 \\ &= 2.64\end{aligned}$$

$P = 436$ g./24 hr./0.001 in./100 in.^{2}

The agreement of these values in more than half of the experiments has been found to be within the limit of probable experimental error. The agreement of calculated versus measured values is, in fact, considerably better than the goal of two set at the start of this investigation. Only acetone lies outside this arbitrary two-fold limit.

This investigation thus provides a means for the chemist or packaging engineer to calculate completely from theoretical considerations, or to extrapolate from a single point, a complete spectrum of permeability values.

Acknowledgements

The author wishes to express his appreciation for their aid and cooperation to the following: Dr. Henry A. Bent, now at the University of Minnesota, who showed

(*To page* 237)

IS BLACK A COLOR?

Strictly speaking no, yet ADP frequently is called upon
to match a certain shade of black. Can we do it?
Of course . . . black or any other color . . .
because color dispersions are our business.

Matching shade is only the beginning. Because ADP
dispersions are colloidal in nature, they remain uniform
throughout the compound . . . and a little goes much
further than ordinary mixtures. So your end product is
better and costs less, too. And when you re-order, you
will get the same shade, same uniformity, same economy.

Instead of wrestling with costly dispersion problems
yourself or putting up with ordinary mixtures
produced by other methods, call in an ADP specialist.
He will work closely with you on an individual basis.
Your business is plastics . . . ours is
controlled dispersions . . . any color, and black.

***controlled colors by adp**

ACHESON DISPERSED PIGMENTS CO.

MORRIS BUILDING, PHILADELPHIA 2, PA. — A UNIT OF ACHESON INDUSTRIES, INC.

West Coast Distributor: B. E. Dougherty Co., Los Angeles 21, California

In Europe: ACHESON COLLOIDS LTD., 18 Pall Mall, London, S.W.1, England

*Because ADP dispersions are colloidal in nature, with pigment particles of microscopic size.

High-loading-rate

tensile properties of thermoplastics

By Stephen Strella and Lucius Gilman†*

This article describes briefly a high-rate tensile tester which measures the tensile strengths of plastics when the specimens are broken in time intervals from about 5 to 40 milliseconds. Data constituting a preliminary survey of 20 thermoplastics are given and provide the first published strength values under high-loading-rate conditions which we know of for these materials. The materials tested are listed in Table I, below. Most of the common thermoplastics are represented, but polymethyl methacrylate is missing because all of the samples of this material broke in the test grips. For one Type 1 rigid polyvinyl chloride (Material No. 16), tensile strengths were determined at eleven rates with breaking times from 0.006 sec. to 2900 sec. (48 min.). For the remaining materials, data on tensile strengths at two low rates have been determined and are reported for comparative purposes. These latter low-rate data were determined at

* Ordnance Corps' Plastics Laboratory, Picatinny Arsenal, Dover, N. J.
† Formerly Director, Plastics Laboratory, Picatinny Arsenal; present address Materials Advisory Board, National Research Council, Washington 25, D. C.

Table I: Tensile strengths of plastics at various rates of loading

Material	High rate of loading — Tensile strength, average	High rate of loading — Time to maximum strength, average	Loading at 3200 p.s.i./min. — Tensile strength, average	Loading at 3200 p.s.i./min. — Time to maximum strength, average	Loading at 800 p.s.i./min. — Tensile strength, average	Loading at 800 p.s.i./min. — Time to maximum strength, average
	p.s.i.	10^{-3} sec.	p.s.i.	10^{2} sec.	p.s.i.	10^{2} sec.
1. Cellulose acetate, high acetyl, MS	11,400	8.8	6,250	1.2	5,270	4.0
2. Cellulose acetate butyrate, MS	6,630	8.4	4,610	0.9	4,230	3.2
3. Cellulose acetate butyrate, MH	9,780	7.1	6,870	1.3	7,180	5.4
4. Ethyl cellulose	11,400	6.9	6,480	1.2	6,090	4.6
	11,600	6.3				
5. Polyethylene, low molecular weight	1,370	17	1,250	0.23	1,130	0.85
6. Polyethylene, standard molecular weight	3,350	11.5	2,810	0.5	2,980	2.2
7. Polyethylene, high molecular weight	8,490	8.8	5,370	1.0	4,950	3.7
8. Polystyrene, modified with GR-S rubber	9,960	8.0	6,550	1.2	6,190	4.6
9. Polystyrene, modified with acrylonitrile-butadiene copolymer	7,830	8.3	6,790	1.3	6,620	5.0
10. Polystyrene, unmodified	11,200	6.6	8,840	1.7	8,490	6.4
11. Polyvinyl chloride, type 3	10,400	7.3	6,300	1.2	6,470	4.9
12. Polyvinyl chloride, type 3	11,700	16	6,340	1.2	6,600	5.0
13. Polyvinyl chloride, type 2	10,400	9.2	6,680	1.25	6,620	5.0
14. Polyvinyl chloride, type 2	9,140	7.7	7,040	1.32	6,920	5.2
15. Polyvinyl chloride, type 1	13,900	16	8,510	1.6	8,330	6.2
16. Polyvinyl chloride, type 1	15,400	10	8,800	1.7	8,440	6.3
17. Polyvinyl chloride, type 1	15,600	9.5	9,450	1.8	9,120	6.8
18. Polyamide, with carbon black	11,400	9.0	8,190	1.5	7,010	5.3
19. Polyurethane	10,400	6.5	8,740	1.6	8,460	6.3
20. Polystyrene, glass-fiber-filled	21,100	9	14,100	2.6	12,700	9.5

CYANAMID

CORROSIONEERING with LAMINAC®
(Polyester Resins)

Reinforced Plastic Trays outlast metal prevent contamination in drying corrosive materials

During two years of continuous service, 9000 drier trays molded of reinforced LAMINAC Polyester Resin have proved superior to coated metal trays for drying dye intermediates, pigments and other corrosive chemicals.

Fabricated by Molded Fiberglass Tray Company, the trays are in use at Cyanamid plants at Bound Brook, New Jersey, and Willow Island, West Virginia.

They have no coating to chip or flake, cannot rust, and thus do not contaminate materials being dried. Chipping of coated metal trays frequently meant discarding them or transferring them to uses not requiring freedom from rust. Men working with the trays like their lighter weight and ease of handling.

These glass-reinforced LAMINAC trays combine excellent hot strength with outstanding resistance to many of the most active chemicals other than alkalis. High impact and dent resistance makes them suitable for hard use. On the basis of this experience, engineers in the two plants have almost completed replacement of all metal trays with reinforced LAMINAC.

If corrosion is your problem, consider reinforced LAMINAC. Get in touch with any of our offices listed below.

AMERICAN CYANAMID COMPANY
PLASTICS AND RESINS DIVISION
32 Rockefeller Plaza, New York 20, N. Y.

In Canada: North American Cyanamid Limited, Toronto and Montreal

Offices in: Boston · Charlotte · Chicago · Cincinnati · Cleveland · Dallas · Detroit
Los Angeles · New York · Oakland · Philadelphia · St. Louis · Seattle

CYANAMID Plastics and Resins Division
MATERIALS FOR TOMORROW

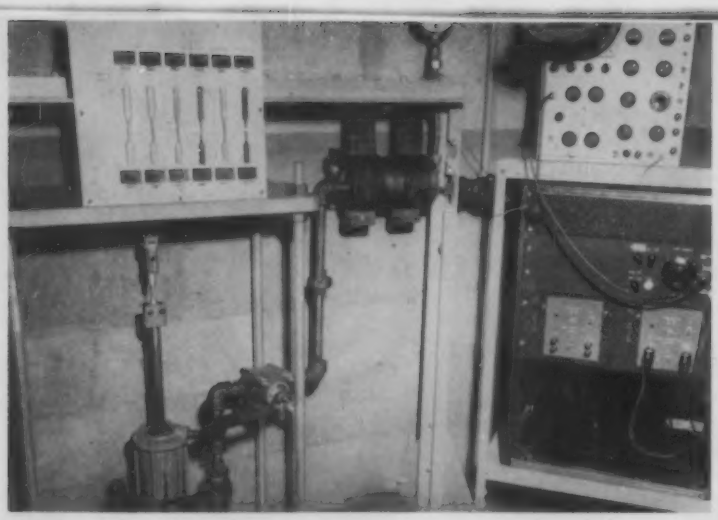


Fig. 1: High-rate tensile tester

constant rate of load increase rather than at constant rate of grip separation, and, accordingly, are of interest in themselves.

Equipment

The Picatinny Arsenal high-rate tensile tester (Fig. 1, above) consists of three units—the load-applying unit, the measuring unit, and the recording unit.

The unit that applies the load is a 4-in.-diameter, high-pressure air cylinder 12 in. long, fitted with a piston and connecting rod. Six slots 4½ in. long and ⅛ in. wide have been cut through the walls of the cylinder parallel with its axis and starting 2⅜ in. from the top end of the cylinder. During operation, high-pressure nitrogen is admitted to an adjacent storage chamber. This gas is then released into the top end of the loading cylinder through a fast acting valve. The piston moves rapidly down the cylinder, pulling the connecting rod, the lower grip, and the lower end of the test specimen. The specimen is fractured by the time the piston has traveled 2⅜ inches. After the 2-in.-thick piston has passed through 4⅜ in. of travel, the driving gas begins to escape through the side slots. After 7 in. of travel, the piston traps air ahead of it in the bottom of the cylinder. This end is closed, so the piston is brought to a stop against an air cushion.

Gas pressures of 1700 to 2000 p.s.i. will produce fracture in about 0.006 second. Gas pressures of 150 p.s.i. will produce fractures in about 0.040 second. Lesser gas pressures do not produce fracture reliably.

The unit that measures the load is a hollow steel cylinder. This cylinder is mounted axially between the top grip and a rigid upper support. Extension of the cylinder is proportional to the load applied, and this extension is measured by SR-4 strain gages attached to the cylinder. The strain of the gages is converted to a voltage by having the gages as one arm of a Wheatstone bridge circuit. This voltage is now a measure of the load on the specimen. This load voltage is amplified by a wide-band d.c. amplifier and then is passed into a suitable oscilloscope. The load-time curve produced on the oscilloscope screen is photographed by a Polaroid camera. The screen of the oscilloscope has a rectangular grid marked off in centimeter squares and has fifths of a centimeter marked along a central horizontal axis and along a central vertical axis. This grid is photographed along with the trace. The sweep of the oscilloscope is adjusted according to the anticipated time of the test. The vertical or load reading is adjusted by various resistances to give the desired range of pounds per centimeter.

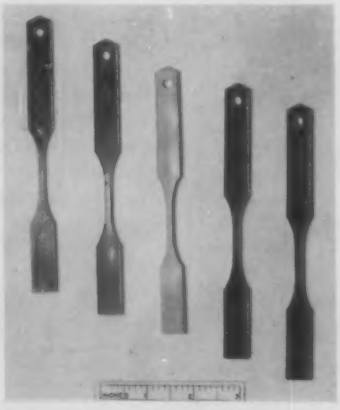


Fig. 2: Several high-rate tensile specimens

The Picatinny Arsenal machine utilizes the basic idea of a gas actuated cylinder with a quick opening valve which had been used by the Massachusetts Institute of Technology earlier ("High-Speed Tension Testing Machine for Plastics," by J. Dorsey, F. J. McGarry and A. G. H. Dietz, ASTM Bulletin No. *211*, p. 34-37, Jan. 1956). The difference in design of the Picatinny Arsenal machine was principally for the purpose of getting the specimen into a more convenient location and to secure rapid development of the photographs without use of a darkroom.

The most serious limitation of the Picatinny Arsenal machine is that no measurement of elongation is made. Another serious limitation is that the machine does not operate at a constant rate during a given test; the piston is moving faster at the end of the test than it is at the beginning. However, fracture in 0.005 sec. is about 600 times as fast as fracture in 3 sec., which we take as about the fastest fracture that can practicably be obtained and recorded with standard available testing machines. Accordingly, a considerable variation in rate during the test would still be small compared with an increase in rate by a factor of 600. As a result, we should be able to draw valid conclusions about approximate strength values at high rates and about trends and properties at high rates compared with properties observed at low rates. Recognizing that the present Picatinny Arsenal machine has both definite utility and definite limitations, we have collected data with this machine while working on further development of a machine that in addition will record strain, will operate closer to a constant rate, and preferably will operate at still higher rates.

The specimens (Fig. 2, left)

For precision and versatility—choose
OWENS-ILLINOIS for PLASTICS

For example—
Plastainer vials . . . available in clear plastic and a wide variety of attractive colors, opaque and transparent, with colorful matching closures.
For example—
A handy tumbler
For example—
A lady's compact
Your Name

Owens-Illinois packaging know-how and high-quality standards offer you the *finest* in molding plastic facilities . . . Injection molding . . . Compression molding . . . A complete range in plastics for packaging, for specialties.

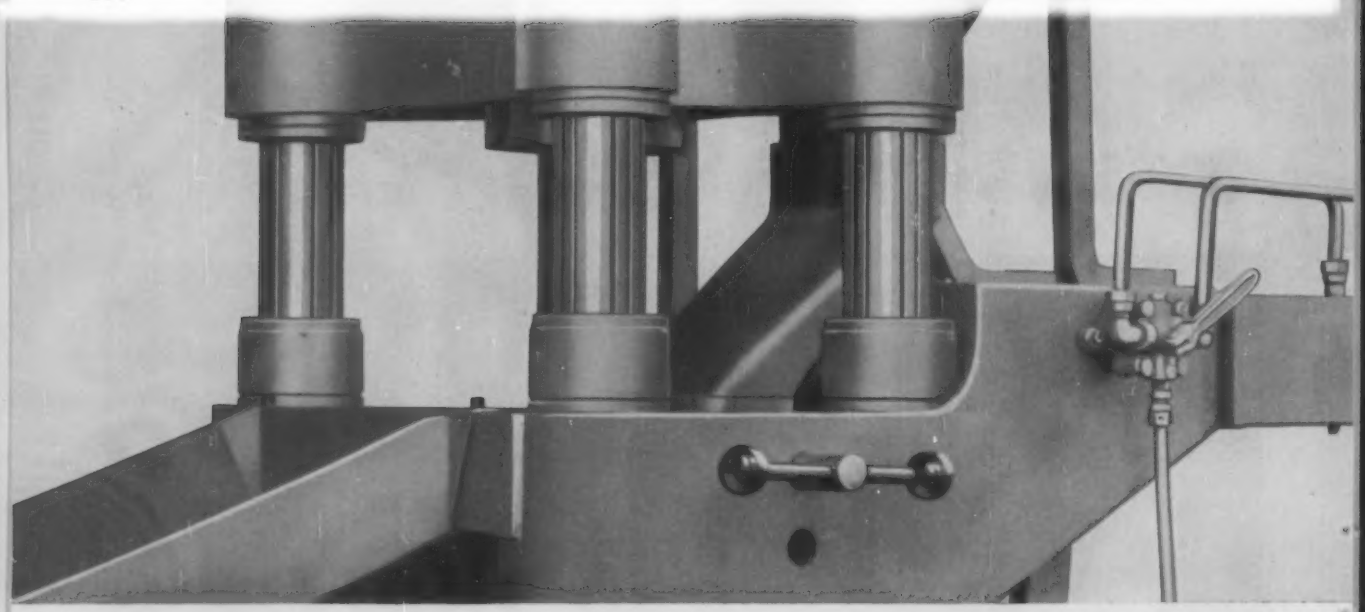
Branch Offices:

Albany, New York
Atlanta, Georgia
Baltimore, Maryland
Birmingham, Alabama
Boston, Massachusetts
Buffalo, New York
Charleston, West Virginia
Charlotte, North Carolina
Chicago, Illinois
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Dallas, Texas
Denver, Colorado
Detroit, Michigan
Fresno, California
Hartford, Connecticut
Houston, Texas
Indianapolis, Indiana
Jacksonville, Florida
Kansas City, Missouri
Los Angeles, California
Louisville, Kentucky
Memphis, Tennessee
Milwaukee, Wisconsin
Nashville, Tennessee
New Orleans, Louisiana
New York, New York
Oakland, California
Oklahoma City, Oklahoma
Omaha, Nebraska
Peoria, Illinois
Philadelphia, Pennsylvania
Pittsburgh, Pennsylvania
Portland, Oregon
Richmond, Virginia
Rochester, New York
Sacramento, California
St. Louis, Missouri
St. Paul, Minnesota
Salt Lake City, Utah
San Francisco, California
Seattle, Washington
Toledo, Ohio
Yakima, Washington

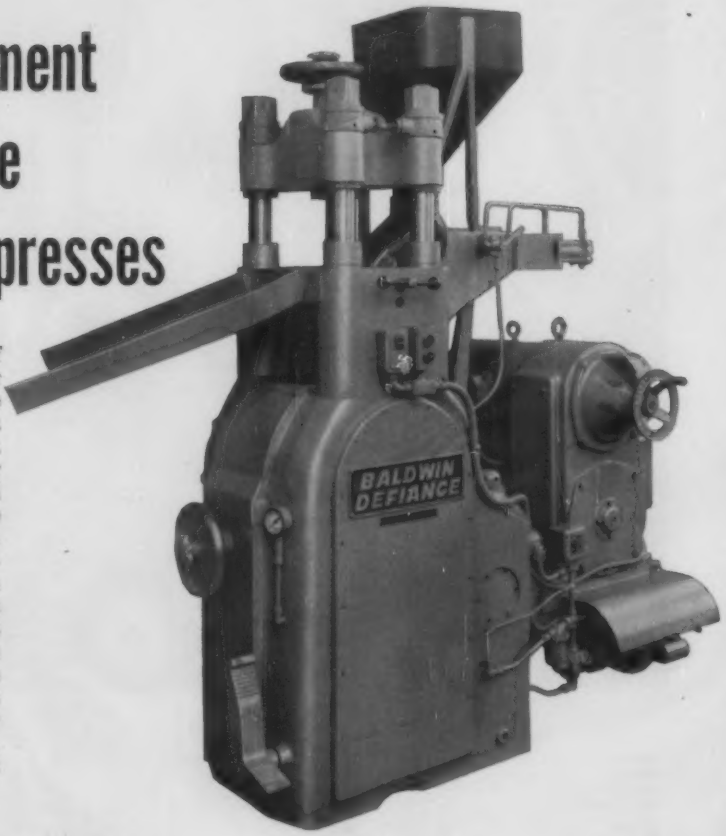
Pacific Coast Headquarters, 350 Sansome St., San Francisco; Plants at San Jose, Calif.; St. Charles, Ill.; Glassboro, N. J., and Riverdale, N. J.

OWENS-ILLINOIS PLASTICS
AN (I) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO



How precision alignment increases die set life in Baldwin preform presses



Typical of the many outstanding features of Baldwin compacting presses is use of four rigidly guided tie rods to provide precise die alignment. Two connecting rods transmit balanced pressure from the crankshaft to each tie rod. The resulting uniform force, together with rigid guiding, maintains true parallel motion of the upper platen. This increases the life of the machine and of the die sets used. Precision alignment is just one of many practical benefits you will get from the careful design and engineering that go into the Baldwin Models 20 and 45. These many advantages are proved through years of rugged service in the field . . . added proof that Baldwin plastics molding and preforming presses are the finest in the industry. Why not send today for Bulletin No. 3103 containing complete details. Address Dept. 4863, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio.

EXCLUSIVE FEATURES OF BALDWIN PLASTICS PRESS

1. **Safeguard lubrication reduces downtime.**
2. **Balanced pressure maintains uniform preform thickness.**
3. **Cam controlled feeder assures uniform tablet weights.**
4. **Simple adjustments allow weight-density changes during operation.**
5. **Cleanline design prevents contamination, speeds cleaning.**

Hamilton Division Hamilton, Ohio

BALDWIN · LIMA · HAMILTON

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools

BALDWIN BLH LIMA-HAMILTON

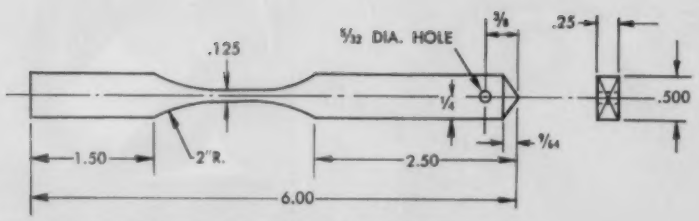


Fig. 3: Dimensional details of high-rate tensile specimens

Table II: Effect of rate of loading on tensile strength of rigid polyvinyl chloride

Crosshead speed of Instron machine	*Time to yield*	*Tensile strength*
in./min.	*sec.*	*p.s.i.*
—	0.0061	16,900
—	0.0087	16,000
—	0.014	15,000
—	0.038	13,600
20.0	0.309	11,300
5.00	1.25	10,400
1.00	5.18	9,310
0.200	23.4	8,600
0.100	47.5	8,390
0.020	246	7,980
0.002	2,900	7,400

were injection molded and were ⅛ by ¼ in. in cross section with a 1-in.-long gage length. Details of the specimen are shown in Fig. 3, above.

Tensile strength data

The data shown in Table II, above, and presented graphically in Fig. 4, right, were obtained partly with the high-rate tester and partly with an Instron tester. Tests in times from 0.006 to 0.038 sec. were performed on the high-rate tester, while tests in times from 0.31 sec. to 2.9×10^3 sec. (48 min.) were performed on the Instron machine. The standard Speedomax recorder was used for tests at 5.2 sec. or longer, but an oscilloscope with camera was used for tests at 1.25 and 0.31 second. For the tests requiring from 5.2 to 2.9×10^3 sec., the crosshead of the Instron tester was moving at essentially constant speed throughout each test. For the tests requiring 0.31 and 1.25 sec., it is probable that the test was not performed at constant rate and that the crosshead was accelerating significantly during the test. However, the total time to maximum load was accurately determined. The fastest test was performed 480,000 times as fast as the slowest. In all instances, the strength reported is the maximum load that was attained. Because these polyvinyl chlorides "neck" and draw in a ductile manner, the maximum tensile strength is that which is recorded just before necking begins, the tensile strength at break being less.

The data show that the tensile strength somewhat more than doubled when measured at the shortest time compared with the longest and that the rate of increase in strength rose most markedly at the shorter time intervals. Qualitatively, this is about what most plastics personnel would have expected, but the magnitude of the strength increase will probably surprise most observers. In addition, many of us would have thought that, since plastics are more brittle under impact conditions, the strength might have risen in going from long time tests to perhaps 0.1 sec. and might have been expected to decline at still shorter times. Although there may well be some very high rate at which failure will become brittle and strength will remain constant or will decline, there is no evidence of such a change for this material in intervals as short as 0.006 second.

The data in Table I and Figs. 5 through 9, p. 158, differ in several respects from Table II and Fig. 4. In the first place a wide variety of materials is included in Table I and Figs. 5 through 9, but the number of rates per material is much less. Accordingly, the lines drawn in Figs. 5 through 9 should be recognized as being simply a matter of convenience in connecting data points of the same material. These lines are not intended to be graphs of the strengths of these materials at the intermediate time intervals. Judging from the shape of the curve in Fig. 4, it is almost certain that the straight lines in Figs. 5 through 9 do not represent proper graphs of intermediate values. In addition, the low rate tests were performed at constant rate of load increase rather than at constant rate of crosshead travel.

Nevertheless, these preliminary, exploratory determinations do show the general nature of the effect of increasing rate on the strength of plastics and show how very differently various polymers behave. Finally, these data give specific tensile strength values at specific high rates of from 0.006 to 0.017 sec. loading time.

The low-rate tests represented

(*To page* 166)

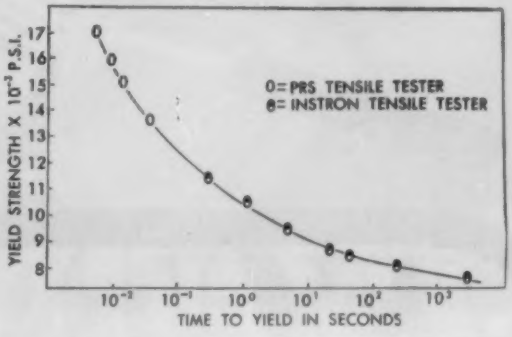
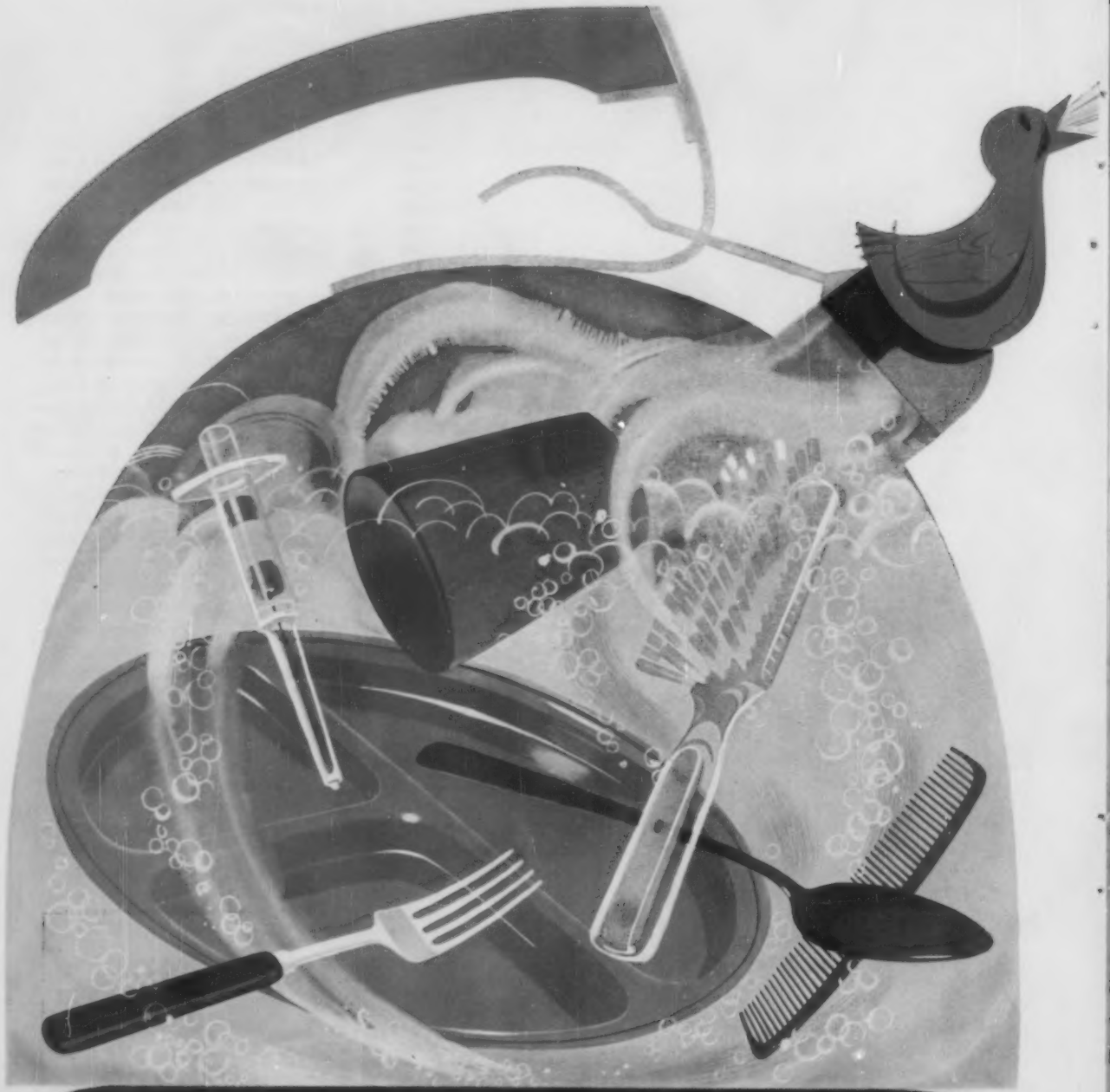


Fig. 4: Rigid polyvinyl chloride yield strength versus time to yield

BALDWIN · LIMA · HAMILTON

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools

CYM



10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1}
TIME TO YIELD IN SECONDS

AC*

Methyl-Styrene Molding Compounds

*Trademark

Announcing New Thermoplastic Molding Compounds...CYMAC

—based on Methylstyrene Monomer

NOW AVAILABLE—two compounds so heat resistant that products molded from them show no distortion after repeated, extended immersion in boiling water.

1. CYMAC 400 Polymethylstyrene—offers unusual heat resistance *plus* all the desirable properties of polystyrene, including excellent electrical properties, clarity, luster, and unlimited range of transparent and opaque colors.

2. CYMAC 201 Methylstyrene-Acrylonitrile Copolymer—offers better toughness, chemical and craze resistance than CYMAC 400—*plus* heat resistance, clarity, luster, and wide color range.

Both of these new molding compounds provide the added value of remarkable heat resistance at costs no greater than competitive materials.

These new methylstyrene thermoplastics are made possible by revolutionary new processes developed by Cyanamid. They will help you upgrade existing molded products, and find new applications in consumer and industrial fields.

Turn opportunity into reality NOW. Write or call today for complete information and samples.

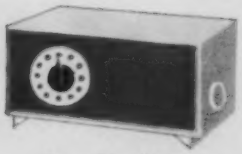
CYANAMID

AMERICAN CYANAMID COMPANY

PLASTICS AND RESINS DIVISION 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

In Canada: North American Cyanamid Limited, Toronto and Montreal

For automotive parts

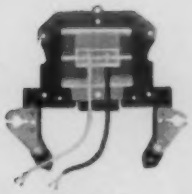


For radio cabinets

For refrigerator parts

For business machine housings and parts

For pen barrels



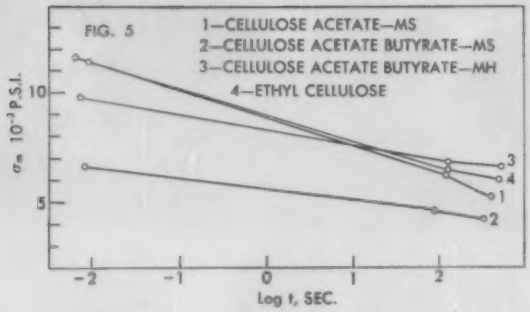
For electrical parts

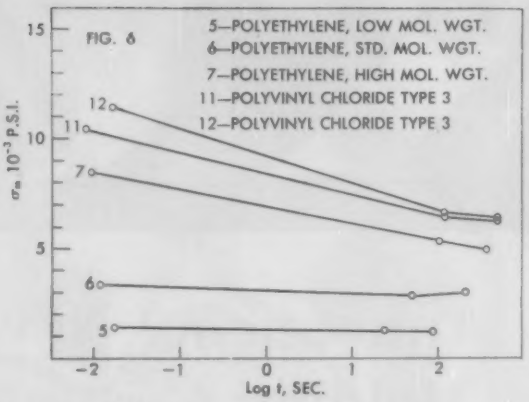
For fan blades

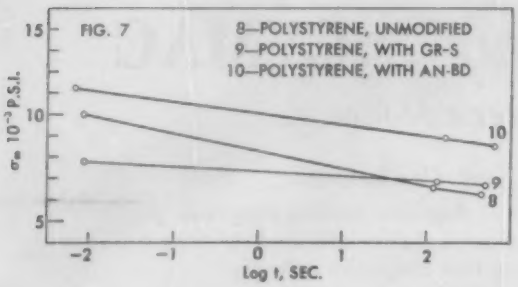
For battery cases

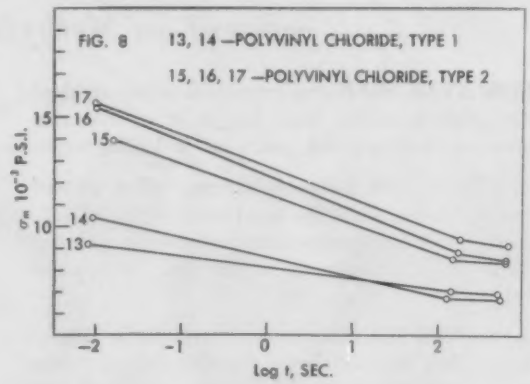
For wall tiles

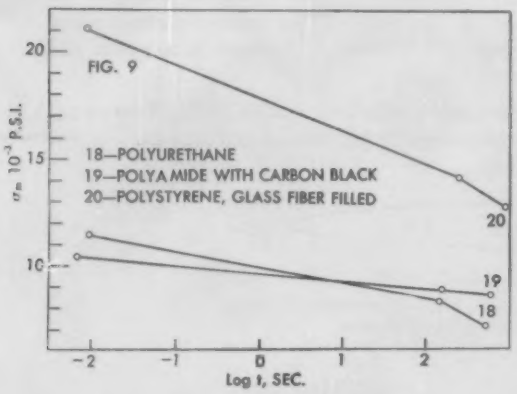
. . . and hundreds of other products











Figs. 5 through 9: Low-rate tensile tests of 20 plastics materials. The same tensile specimens used in the high-rate tests were used in these low-rate experiments

in Figs. 5 through 9 were performed using the same tensile specimens as on the high-rate tests but were performed on a Tinius Olsen Plastiversal testing machine operated at constant rate of load increase. Operation under these conditions was obtained by manual adjustment of the speed of the machine to keep the load pointer on the dial opposite a pacer which moved at the desired rate of load increase. Low rate tests were performed at 800 p.s.i./min. and at 3200 p.s.i./min.

Constant rate of load increase had been chosen, because we thought originally that the high-rate tester was operating at approximately constant rate of load increase. We learned later that the high-rate tester operates at approximately constant rate of load increase only below the yield point of the plastic specimen.

The tensile strength values obtained for each of the 20 materials at each of the two low rates and at one high rate are given in Table I. Each of the averages given is based on five or six reasonably close results except in the case of the high rate results for polyvinyl chlorides No. 11 and No. 16 for which only two values were available and for polyvinyl chloride No. 17 which is based on one value only. Groups of these data have been plotted on the accompanying charts (Figs. 5 through 9). It should be emphasized again that the lines connecting related data points on the charts are not intended as graphs of the tensile strengths of these materials at intermediate rates. It would be premature to deduce a reliable knowledge of tensile strengths at intermediate rates when the data are confined to three points per material and there is such a great difference in rate between low and the high rate determinations. These lines are intended at this time solely to connect related data points for reference.

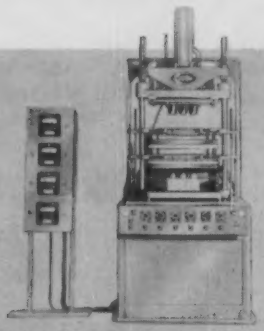
General effects

Considering the effect of increasing rate on the tensile strengths of these materials, there

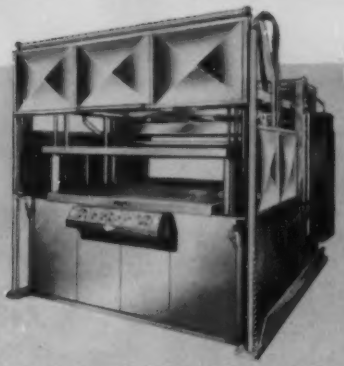
(*To page* 238)

MODELS FOR EVERY REQUIREMENT...

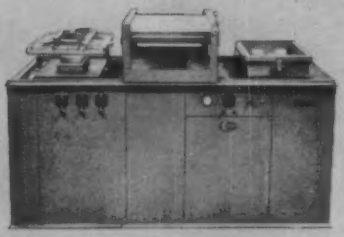
VacForm automatic and semi-automatic VACUUM FORMING MACHINES



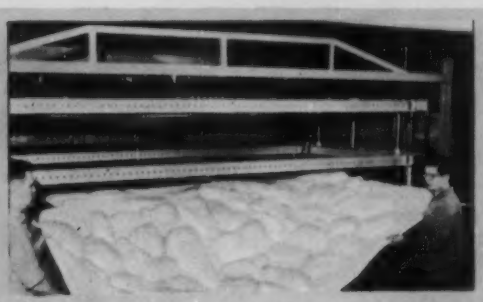
VAC-TRIM combines straight vacuum, drape and plug forming—plus automatic trimming—in a single machine. Saves equipment costs, labor, floor space. Push-button operation. Complete flow-control system.



VacForm standard production models can produce plastic products ranging from eyeglass cases to refrigerator door panels. Use molds from 2" x 2" to 50" x 74". Bigger sizes can be built to your specifications.



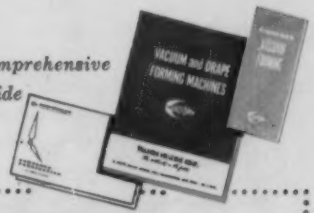
VacForm 88FM can be used for research, development, and many commercial applications. It is a low-priced, general purpose forming machine that can be used profitably by smaller manufacturers. This model is also useful to large companies as an experimental unit.



VacForm "GIANT" is world's largest vacuum forming unit. This model, engineered and built for National Broadcasting Company, has a forming area 12' long and 6' wide, is used for low-cost three-dimensional TV scenic elements. Comparable models are built to special order for a wide range of special applications.

Choose from an extensive line of VacForm machines for production and research. A pioneer and specialist in vacuum forming, VacForm serves such leading manufacturers as Du Pont, Chrysler, General Electric, Dow Chemical, among many in the appliance, automobile, packaging and plastics industries.

Write today for comprehensive vacuum forming guide and catalogs.



VACFORM

PLASTIC FORMING MACHINERY

EMHART MANUFACTURING COMPANY

HENRY & WRIGHT DIVISION

760 Windsor Street • Hartford 1, Connecticut

EMHART MANUFACTURING COMPANY
Henry & Wright Division
760 Windsor Street, Hartford 1, Connecticut

Send us new reports on Vacuum Forming:

Name_____ Title_____

Company_____

Street_____

City_____ Zone____ State_____

Principal business_____

P-457

Coloring of polyethylene

*By F. J. Hines**

Coloring polyethylene is a process influenced by the choice of colorants and processing factors such as equipment, temperatures, time, etc. The latter conditions play an important role in choice of suitable colorants.

Since a large percentage of polyethylene production is delivered to consumers uncolored, a certain portion of it is colored by the compounders and molders in their own plants. It is these consumers that it is hoped will be aided by the presentation of this paper on our coloring experiences.

Paper presented at the Perkin Centennial Meeting of the American Association of Textile Chemists and Colorists, New York, N. Y., Sept. 1956.
*Catalin Corp. of America

Equipment requirements

Equipment for coloring polyethylene will depend greatly upon the quality of product desired. Polyethylene for wire coating, film, or other critical applications should have maximum colorant dispersion, for reasons that will be mentioned further below in this article.

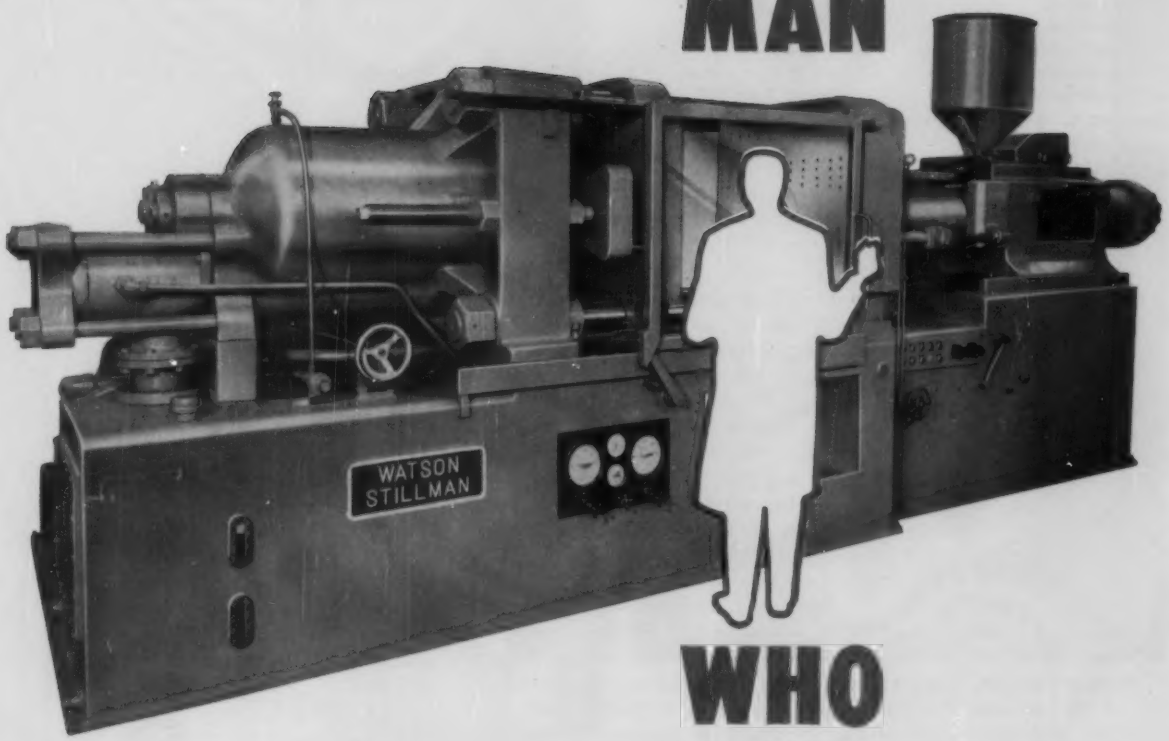
For maximum dispersion, a blending unit, usually a stainless steel drum revolving end over end, is used to blend the polyethylene with the coloring agent. The surface-coated polyethylene

Table I: Colorants for polyethylene

Colorants	*Type*	*Bleeding*	*Exudation*	*Heat stability*[a]	*Light stability*[b]	*Remarks*
A. General use						
Cadmium red dark	Inorganic pigment	None	None	Excellent	Excellent	Stable colorants. New Mercadium colorants (Imperial Paper & Color Corp.) appear to have similar stability in preliminary tests.
Cadmium red medium	" "	"	"	"	"	
Cadmium red extra light	" "	"	"	"	"	
Cadmium yellow	" "	"	"	"	"	
Phthalocyanine green	Organic pigment	"	"	Very good to excellent	Very good	Bright, stable, essentially transparent colorants.
Phthalocyanine blue	" "	"	"	Very good	Very good	
Calcined iron oxide pigments	Inorganic pigment	"	"	Excellent	Excellent	Dull yellows, reds, and brown shades.
Carbon black	Channel carbon black	"	"	"	"	Recommended for weathering.
Titanium dioxide	Rutile	"	"	"	Very good	Less reactive than anatase TiO_2.
B. Limited use						
Supermaroon #544J[c]	Organic pigment	Very slight	Very slight	Fair	Fair to moderate	Must be processed below 475° F. Brighter than colorants under "A. General use."
Calcium lithol toner	" "	Slight	Slight	Fair	Fair	
Bon red (2B acid)	" "	Very slight	Very slight	Fair	Fair	
Red lake C toner medium	" "	" "	" "	"	"	Concentration tends to affect bleed and exudation characteristics.
Molybdate orange	Inorganic pigment	None	None	Fair	Good	Process below 475° F.
Chrome yellow	" "	"	"	"	"	Process below 475° F.
Titanium dioxide	Anatase	"	"	Very good	Very good	Tends to be more reactive than rutile TiO_2.

[a] Heat stability tests run at 550° F., 500° F., and 450° F.
[b] Light tests run in an Atlas Fadeometer:
fair = some fading or discoloration before 60 hr.;
good to very good = some fading or discoloration between 128 and 256 hr.;
very good to excellent = stable to more than 256 hours.
[c] Kentucky Color & Chemical Co., Inc.

ASK THE MAN



WHO HAS ONE

The best way to evaluate and compare the performance of the W-S 24-ounce injection-molding machine is to ask the man who has one.

Field reports show that molders who are equipped with the W-S 24 rate it as the finest machine in the industry. They like its smooth operating efficiency and high production capacity.

Specifically, they like the heating-cylinder performance, faster cycles, lower material temperatures and higher plasticizing capacities.

They like the advanced design features which are engineered into the machine. And they like the specifications: Die space 27" x 45" . . . injection rate 1800 cu. inches per minute . . . plasticizing capacity 250 pounds per hour.

The next time you're in the market for a new machine . . . investigate the W-S 24. In the meantime, send for your free copy of Bulletin 623 which describes the 24-ounce machine in detail.

WATSON-STILLMAN PRESS DIVISION
FARREL-BIRMINGHAM COMPANY, INC.
150 Aldene Road, Roselle, New Jersey

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
European Office: Piazza della Republica 32, Milano, Italy
Represented in Canada by Barnett J. Danson,
1912 Avenue Road, Toronto, Ontario

WATSON-STILLMAN

WS-30

Table II: Ultra-violet and infra-red absorption of various colorants

Pigment	Ultra-violet absorption		Infra-red absorption	
	350 mμ	375 mμ	800 mμ	100 mμ
	%	%	%	%
Rutile TiO_2	87	85	14	16
Carbon black	95	95	97	97
Red iron oxide	95	95	78	70
Cadmium red (lithopone)	95	93	10	10
Cadmium yellow (lithopone)	94.6	95	9	9
Chrome yellow	96.8	96.8	10	10
Molybdate orange	96	96	15	15
Phthalocyanine blue	97	97	93	62
Ultramarine blue	74	69	75	50
Phthalocyanine green	96	96	92	75
Anatase TiO_2	86	43	8	8

is then processed at fluxing temperature in a Banbury-type mixer in order to completely color the mass of polyethylene. A two-roll mill is required in the next step to sheet the polyethylene in a suitable form for granulation after which the colored polyethylene is ready for molding or extrusion operations.

In many cases, sufficient colorant dispersion is accomplished if the coated polyethylene from the blending unit is simply extruded and granulated before extruding to shape or molding. However, the size of the extruder, the flight of its screw, and other modifications that increase mixing of the molten color mass, play an important role in determining the efficiency of this system.

The simplest method, but the least effective for coloring polyethylene, involves only the use of a revolving drum, usually a 55-gal. stainless steel type, for blending resin and colorant together before molding or extruding the finished product.

All methods require a suitable balance which will weigh as little as 0.1 g. of colorant (in some tints even smaller weights may be needed) and a scale that is suitable for weighing the polyethylene material.

Modified colorants

Modifying the colorant by a wetting out or predispersion aids considerably in improving conditions for coloring and, as a result, the quality of the finished product. Adding 1 to 2% mineral oil to the mixing polyethylene granules 5 min. before addition of the colorant quickly reduces dusting and aids in the even distribution of colorant upon the surface of the granules. Also, the tendency of the heavier colorants to settle to the bottom of the drum is greatly reduced when the polyethylene granules are first wetted out.

Another means of modifying the colorant is by predispersion in mineral oil. This can be accomplished by the use of a three-roll paint mill or pebble mill. The advantage obtained is that the colorant is reduced to its ultimate particle size before it is used in the coloring process. The prepared color paste is added to the polyethylene, blended in the revolving drum, and then passed on to the next process, which may involve further mixing or fabricating machines.

While mineral oil appears to be extremely useful in the preparation of colored polyethylene, too high a percentage may result in spewing or poor material feed to extruders or molding machines. Furthermore, it has been reported (1)[1] that formulations containing mineral oil have been found to show a tendency to degrade over a period of time.

Predispersing a high concentration of colorant in polyethylene is used also as a means of reducing agglomerates or particle size before the actual coloring process takes place. Usually, this dispersed form of the colorant is referred to as a master batch. Ordinarily, 5 to 10 parts of the master batch in granular or pellet form is mixed with 90 to 95 parts of natural polyethylene. The resulting fabricated item produced from this mixture of colorant and polyethylene will show good colorant dispersion, especially if extruded or mixed in a Banbury beforehand.

Color range

The colors producible in polyethylene range from essentially transparent to opaque. The natural milkiness of polyethylene, however, limits the transparent effects to very low-gage films. The transparent colorants in higher-gage polyethylene result in colored translucent effects. Opaque colorants yield translucent to opaque effects depending upon the concentration of colorant that is being used in the mixture and the gage of the finished product.

Colorant properties

The colorant properties that are required for polyethylene applications may be summarized as follows:

1) Coloring agents for polyethylene should be of extremely fine particle size either in the dry powder form or predispersed form before entering into the coloring process.

2) They must not react with the resin or discolor at the temperatures that are required for processing.

3) They should at no time bleed or exude from the fabricated articles.

4) Where required, they should have reasonable fastness to sunlight and weathering as determined by the demands of the end-use application.

Pigments of fine particle size that have been completely dispersed in polyethylene are said to improve the weatherability of the resin.

This result has been reported as particularly true with carbon black (2); the writer has seen test data that indicate it is also true to a lesser degree with other pig-

[1]Numbers in parentheses link to references at end of article, p. 245.

Make a name for yourself with 'PERSPEX'

1 *Silk-screen printed 'Perspex' sign in Spanish, manufactured by Cellgrave Co. Ltd., London, S.E.15.*

2 *A specimen 'Guinness' clock sign made in coloured 'Perspex' sheet by Acme Showcard and Sign Co. Ltd., London.*

'PERSPEX' ACRYLIC SHEET makes the best advertising display signs in any language. It is a bright, handsome material, extremely tough, light and easy to handle, and will stand up to weather conditions in any part of the world.

'Perspex' signs are busy selling goods and services all over the world, all day and every day—and often far into the night. Because 'Perspex' can be transparent, it is ideal for illuminated displays.

'Perspex' is available in clear or opal sheet or in a wide range of transparent, translucent and opaque colours.

'PERSPEX' *is the registered trade mark for the acrylic sheet manufactured by I.C.I.*

IMPERIAL CHEMICAL INDUSTRIES LIMITED · PLASTICS DIVISION
EXPORT DEPT · BLACK FAN ROAD · WELWYN GARDEN CITY · HERTS.

U.S.A. enquiries to: J. B. Henriques, Inc.
521, Fifth Avenue, New York 17, N.Y.

Canadian enquiries to: Canadian Industries Ltd.,
Plastics Dept., Box 10, Montreal, P.Q.

ICI

OP.23

ments. The report on carbon black shows that a particle size of less than 25 millimicrons gave the best weatherability. This is slightly less than 1/1,000,000 in. in size.

It is very unlikely that many other colored pigments can be produced to approach this particle size. However, it has been the function of the carbon black to prevent the entrance of deleterious light into the polyethylene and, obviously, colored pigments, though coarser, will exclude much of the light and aid in extending the life of the product.

Evidently, coarser particles or poorly dispersed material allows the light to penetrate created interspaces. In addition, coarse pigment particles or poor dispersion of agglomerates in polyethylene films will result in streaking and/or pinholes. This pinhole condition improves as the gage is increased and, frequently, the streaking has been found to be less noticeable when the degree of colorant concentration is increased.

Coloring agents that react with the resin may cause odor or raise and distort the polyethylene because of the release of gaseous products.

This is particularly noticeable with Ultramarine Blue, a product widely used in the coloring of other plastics. Hydrated chromium oxide green is noted in that it causes the polyethylene to become brittle upon aging. Anatase titanium dioxide at a high concentration has been under suspicion as a cause of odor development; this is probably brought about by the colorant functioning as a catalyst in the breakdown of the polyethylene.

Table III: Power factor and dielectric constant of colored polyethylene at 1 megacycle

Disk No.	*Colorant concentration*	*Power factor*	*Dielectric constant*
1	Uncolored	0.00032 to 0.00064	1.45
2	0.25% super maroon #544J[a] 0.10% rutile titanium dioxide	0.00064	1.53
3	0.1% phthalocyanine blue toner 0.1% rutile titanium dioxide	0.00036	1.34
4	0.1% phthalocyanine green toner 0.1% rutile titanium dioxide	0.0007	1.42
5	0.4% cadmium yellow 0.1% rutile titanium dioxide	0.00043	1.36
6	0.44% cadmium red	0.00034	1.36
7	0.2% clarion red[b] 0.1% rutile titanium dioxide	0.007	1.33
8	0.2% Bon red (2B acid) 0.1% rutile titanium dioxide	0.00064	1.43
9	0.4% red lake C toner 0.1% rutile titanium dioxide	0.00064	1.45
10	1% calcium lithol toner	0.0010	1.43
11	0.4% burnt sienna 0.1% rutile titanium dioxide	0.00068	1.38
12	0.4% light red oxide R2899[c] 0.1% rutile titanium dioxide	0.00068	1.35
13	0.4% Indian red R-8028[c] 0.1% rutile titanium dioxide	0.00064	1.45
14	0.4% burnt umber 0.1% rutile titanium dioxide	0.0024	1.39
15	0.4% carbon black (channel)	0.0059	1.46
16	1% rutile titanium dioxide	0.00071	1.35
17	0.005% vat pink FF pigment 1.000% rutile titanium dioxide	0.00069	1.35
18	0.005% calcium lithol toner 1.000% rutile titanium dioxide	0.00068	1.35

[a]Kentucky Color & Chemical Co., Inc.
[b]American Cyanamid Co., Pigments Div.
[c]C. K. Williams & Co.

Heat stability of colorants

Ordinarily, it is recommended that colorants of exceptionally good heat stability be used for coloring polyethylene. This applies particularly to compounders who supply colored material for various applications. It is not infrequent for a customer who ordered a colored compound for extruding at a relatively low temperature of approximately 400° F., to use the same material in a molding operation involving a temperature approaching 600° F. There are many colorants stable at 400° F., even for many minutes, that fail at 600° F. before a given fabricating cycle can be brought to completion.

Consideration must be given also to the possibility of hot spots in the fabricating equipment. Chamber walls may reach temperatures far in excess of the temperature indicated on the heat controls and, consequently, colorants of lesser heat stability will fabricate with mottle or streaky color effects. For this reason, it is recommended always to heat processing equipment in stages when colored material is to be processed. By this we mean to set heat controls, when starting up, at approximately one-half the processing temperature to be used, giving sufficient time for the temperature to even out throughout the whole machine. Then the temperature may be raised gradually to the desired temperature. In this way, much of the burning that occurs, even in machines considered to be purged, can be lessened or eliminated entirely. It is not infrequent that streaked moldings are traced to burned material which has been lodged around the nozzle or other parts of the heating cylinder. It requires considerable purging time to eliminate burned material around the nozzle and, in many cases, only a complete dismantling and cleaning of the machine will suffice for critical colors.

Usually, thermal degradation of colorants results in a darkening

(*To page* 242)

Basic raw materials for VINYLS that wipe clean as new in seconds!

One of the most popular features of the new cars is their easy-to-clean vinyl upholstery. More and more, manufacturers of the plasticizers used in hundreds of new vinyl products are depending upon Enjay Isooctyl and Decyl Alcohols to assure superior results in formulation.

If you need technical help in the application or use of any Enjay petrochemical, you can get experienced guidance from Enjay. The modern, well-equipped Enjay Laboratories have recently been expanded and are at your service. Call or write for more information.

Enjay offers a widely diversified line of petrochemicals for industry:

ALCOHOLS & SOLVENTS: Lower Alcohols, Oxo Alcohols, Ketones and Solvents; OIL & FUEL IMPROVERS: Detergent-Inhibitors, V-I Improvers, Oxidation Inhibitors; CHEMICAL RAW MATERIALS: Olefins, Diolefins, Aromatics; ENJAY BUTYL RUBBER & VISTANEX.

ENJAY

Pioneer in Petrochemicals

ENJAY COMPANY, INC., 15 W. 51st STREET, NEW YORK 19, N. Y. Akron, Boston, Chicago, Los Angeles, New Orleans, Tulsa

Plastics Digest*

Abstracts from the world's literature of interest to those who make or use plastics or plastic products. For complete articles, send requests direct to publishers. List of addresses is at the end of Plastics Digest.

Materials

Flow behavior of phenolics under molding conditions. D. I. Marshall. SPE J. *12*, 25-31 (Sept. 1956). The flow properties of phenolic molding compounds may be described as plastic flow with shear-rate thinning. This can be complicated by thixotropy and surface slip. The flow curve and hardening characteristics must be known in detail to understand the behavior of a given molding powder. In the molding of thermosetting materials, the filling of the mold is controlled by the flow curve as it changes with temperature and thermal hardening. Flow stops when the stress value and the yield value approach each other. Methods of measuring these properties and the rate at which the properties change with thermal hardening have been developed. The information obtained is useful for predicting how the mold closing rate and the lowest pressure that will close the mold are expected to change with temperature or any other variable. A theoretical relation between lowest closing force and the yield value was derived. Calculated values were close enough to measured values to indicate soundness of the approach.

Poly-α-methylstyrene. G. D. Jones, R. E. Friedrich, T. E. Werkema, and R. L. Zimmerman. Ind. Eng. Chem. *48*, 2123-31 (Dec. 1956). The properties of poly-α-methylstyrene are reported. This polymer is a thermoplastic with a heat distortion temperature as high as 170° C; the presence of monomer lowers this value. It is outstanding in solvent resistance and hardness. Exposure to high temperatures (ca. 150° C.) causes embrittlement. Information on molecular weight degradation, molding conditions, and other properties are also reported.

Ionic derivatives of polyacrylamide. A. M. Schiller and T. J. Suen. Ind. Eng. Chem. *48*, 2132-37 (Dec. 1956). Ionic derivatives were prepared from polyacrylamide through its chemically reactive amide groups in order to enlarge the scope of its possible uses. Three types of products are described: anionic derivatives via sulfomethylation with formaldehyde and sodium bisulfite; cationic derivatives via the Hofmann degradation reaction with alkali and hypohalite; and cationic derivatives via aminomethylation or Mannich reaction with formaldehyde and amines. The ionic products prepared were evaluated as wet strength resins for paper, soil conditioners, drilling-mud additives, and in other uses that require an ionic, water-soluble polymer.

Polyvinyl trifluoroacetate. H. C. Haas, E. S. Emerson, and N. W. Schuler. J. Polymer Sci. *22*, 291-302 (Nov. 1956). Vinyl trifluoroacetate and its homopolymer were investigated. Polyvinyl trifluoroacetate is insoluble in its monomer and polymerization leads to no increase in degree of polymerization with conversion. Substitution of CH_3 by CF_3 greatly reduces chain transfer and branching. Infra-red spectra of vinyl trifluoroacetate and its polymer are presented and solubilities of the latter reported. Polyvinyl trifluoroacetate is very susceptible to hydrolytic loss of the perfluoro acid. The fluoropolymer is much harder than polyvinyl acetate and higher values are obtained for its softening point and apparent second-order transition temperature. Although no difference can be found by infra-red measurements between authentic polyvinyl alcohol and that obtained by hydrolysis of the fluoropolymer, a large difference in their water solubilities exists. Polyvinyl trifluoroacetate is readily oriented by stretching, and some stretched specimens indicate moderate order and considerable orientation. These results are surprising when considered in the light of the general concepts regarding polymer structure and crystallinity. Extremely highly ordered and highly birefringent polyvinyl alcohol can be obtained readily from stretched polyvinyl trifluoroacetate by conversion of the latter material with gaseous ammonia.

Molding and fabricating

How to get good parts in reinforced plastics. M. Martin. Materials and Methods *44*, 118-20 (Oct. 1956). Design hints for the production of good reinforced plastics parts are given. The reasons why good designing and good quality control are essential are also discussed. Variables that must be kept at a minimum through careful quality control include non-uniform orientation of fibrous glass, gaps and laps, cracks and holes, blisters or air pockets, resin pockets and excess surface resin, starved areas and porosity, wrinkles, delamination, and uncured or tacky areas.

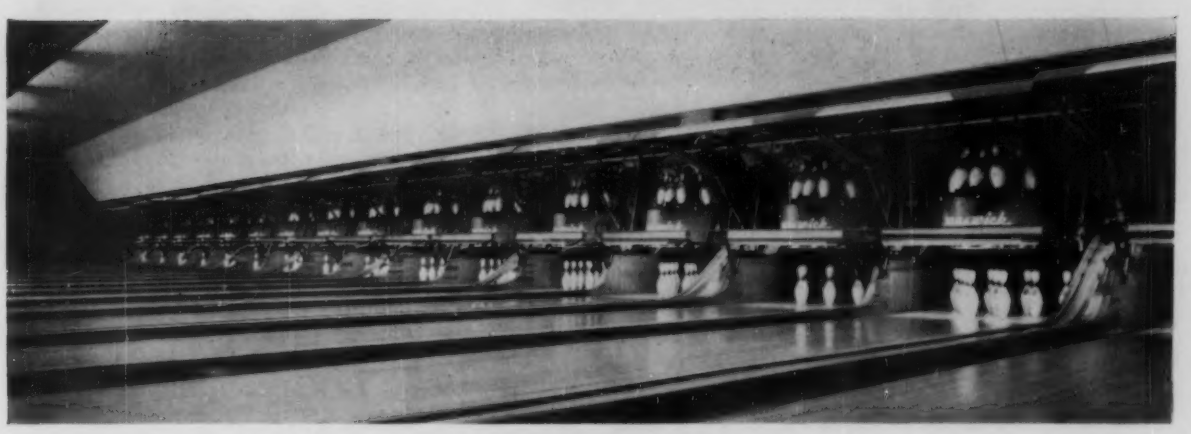
Applications

Plastics missiles. G. E. Dodson. Research & Eng. *3*, 20-21 (Jan. 1957). The applications of plastics in missiles are reviewed. Phenolics, silicones, and polyesters are used. Reinforcements include fibrous glass, asbestos, and quartz fibers. They give satisfactory short-time service where temperatures reach 3000° F. for periods as long as 2 minutes.

Epoxy Resins—an engineering material for the chemical industry —Part 1. B. I. Zolin and J. G. Green. Ind. Eng. Chem. *49*, 61A-62A, 64A, & 70A (Feb. 1957). A series of case histories depicting successful applications of glass

*Reg. U. S. Pat. Off.

"Brunswick finds RCI resin right down its alley!"



Tough, durable rake board for pinsetter made with

RCI POLYLITE

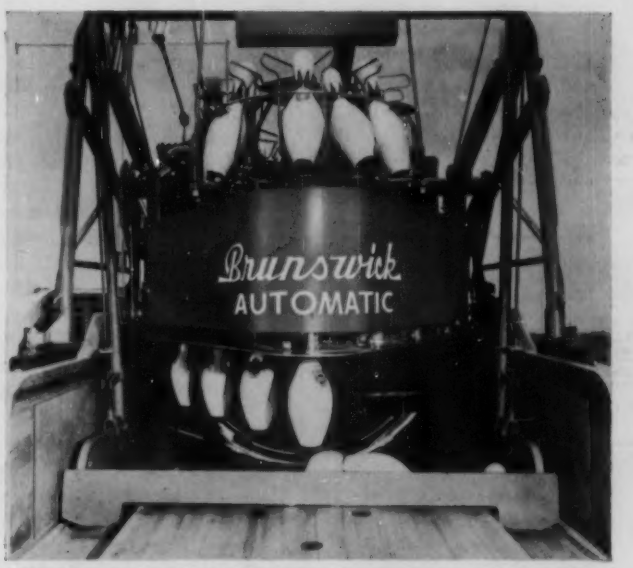
● The automatic pinsetter you see here increases the efficient operation of bowling alleys all over the country. Adds also to the fun and precision of the sport.

In designing this pinsetter, The Brunswick-Balke-Collender Company of Chicago needed a material with special properties for the rake board which clears the "deadwood" from the alley. The board had to be *light, smooth surfaced, tough and wear-resistant.*

Engineers at Brunswick experimented with RCI POLYLITE polyester resin and fibrous glass. They found they could produce a rake board with all the desired qualities by combining POLYLITE, glass fibre mat and outer layers of glass cloth to provide the smooth, wear-resisting surface.

"The most important reasons for our selection of Reichhold's Polyester Resin," say the Brunswick engineers, "were the requirements in this application of exceptional toughness and wear resistance."

Perhaps the combination of light-weight strength, durability and smooth colorful surfaces you get with RCI POLYLITE and fibrous glass construction can be incorporated into one of your products. Why not find out more about what *you* can do with RCI POLYLITE for laminating, molding and other applications? Write to Reichhold for *Booklet A.*



From large sheets of reinforced POLYLITE Brunswick cuts rake boards for its new automatic pinsetter. This close-up photo shows the light, wear-resisting rake board in action removing "deadwood."

Creative Chemistry . . . Your Partner in Progress RCI

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives
Plasticizers • Phenol • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sebacic Acid • Sodium Sulfite • Pentaerythritol
Pentachlorophenol • Sulfuric Acid

REICHHOLD CHEMICALS, INC.,
RCI BUILDING, WHITE PLAINS, N. Y.

Security of supply is a vital consideration in selecting a source, or sources, for wood flour. One reason is the combustible nature of wood flour during milling.

Wilner has two wood flour plants — completely separated — completely redesigned and rebuilt in 1951 — each plant safety engineered from the ground up.

In addition, the Wilner Company controls its own raw materials and its transportation, with elaborate rail facilities and its own fleet of trailer vans, to assure dependable deliveries under any conditions.

Typical Analysis
60 Mesh Wood Flour

Thru	On	%
	60	0
	80	2
140		76.8

Uses of Wood Flour

Wood flour is a *filler* and *extender*, adding strength, bulk, lightness and impact resistance to other more costly materials, such as plastics, linoleum, roofing felt, molded rubber products, wall board and vinyl floor coverings. It is an ideal *absorbent* for explosives, adhesives, rug and fur cleaners, stock feeds, and fertilizers (with built in insecticides?), and an effective *mild abrasive*, for cleaning metal surfaces, such as molds.

Other prospective uses include very fine filtration work; as a *binding agent* and *moisture absorbent* in ore processing; as an *anti-binding agent* to give desired porosity after burn-out in products like firebrick.

For samples, further information and specifications, please write:

Dept. L-3C

Wilner Wood Products Co., Norway, Me.

and Orlon fiber reinforced epoxy resins are discussed. These include 30,000-gal. tanks, structural angles, product carriers, exhaust stacks, and impellers.

Properties

An approach to the design of glass reinforced structures. P. H. H. Bishop. Brit. Plastics *29*, 415 (Nov. 1956). Reference is made to the established design technique of building a structural model when considering structures in fibrous glass laminates. The dimensions and loads associated with the structure are miniaturized and the behavior of various models is observed. This technique is particularly suited for fibrous glass laminates because of the relative ease with which models can be made.

Permeation of polychlorotrifluoroethylene films by nitric acid. F. H. Garner, S. R. M. Ellis, and J. C. Gill. J. Appl. Chem. *6*, 407-12 (Sept. 1956). The permeation of polychlorotrifluoroethylene films by nitric acid was found to occur at a limited number of sites in the surface of the film. These sites were detected by using paper impregnated with a suitable indicator and also by microscopic examination. They were found to be randomly distributed and were mainly macroscopic or visible cracks. Counts were made of the number and size distribution of the cracks. Infrared spectrometry was used to investigate whether chemical reactions occurred between nitric acid and the fluorinated plastic film, but no evidence of chemical degradation products was found.

Sound velocity, Young's modulus, and transition temperature in polythenes with different degrees of crystallinity. M. Baccaredda and E. Butta. J. Polymer Sci. *22*, 217-22 (Nov. 1956). Mechanical dynamic properties of some polythenes with different degrees of crystallinity were measured over a temperature range from —70° C. to above room temperature, at frequencies in the range 5-30 kcps. At room temperature Young's modulus and resonance coefficient increase with increasing crystallinity. A transition temperature, independent of the degree of crystallinity, at about —24° C. is found in partially amorphous polythenes. The transition region is sharper for more amorphous samples. The modulus increases with increasing degree of crystallinity at temperatures above the transition point but appears to decrease somewhat with increasing degree of crystallinity below the transition point.

Calculation of molecular weight and dimensions of polymers from viscosity interaction parameter. S. N. Chinai. Ind. Eng. Chem. *49*, 303-04 (Feb. 1957). An empirical equation for roughly estimating molecular weights of linear, flexible chain, synthetic polymers from viscosity measurements is presented.

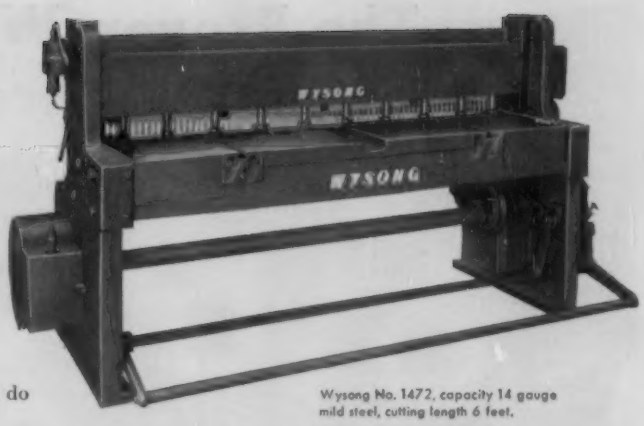
Testing

Study of rheological testing of elastomers at low temperatures. C. K. Chatten, W. E. Scoville, Jr., and F. S. Conant. A.S.T.M. Bulletin No. 217, 47-55 (Oct. 1956). The essential aspects of nine methods for making rheological tests of elastomers at low temperatures and typical results obtained by these methods are discussed and compared. These test procedures may be classified as creep, stress relaxation, recovery, and set methods.

Quantitative analysis in the 2-μ region applied to synthetic polymers. R. G. J. Miller and H. A. Willis. J. Appl. Chem. *6*, 385-91 (Sept. 1956). The application of short-wave spectroscopy, below 2 microns, in the examination and analysis of synthetic polymers is described with special reference to and examples of molecular weight determination by end-group estimation, determination of monomer in polymers, and analysis of copolymers.

New pendulum impact tester. K. W. Ninnemann. Modern Packaging *30*, 163-68, 244, 249 (Nov. 1956). A new pendulum-type impact tester is described for testing film. An electric timer is used to measure the time of swing of the pendulum. Impact strength is the difference between the potential

TRY SHEARING



Wysong No. 1472, capacity 14 gauge mild steel, cutting length 6 feet.

It may be just what you need to reduce costs and do a better cutting job.

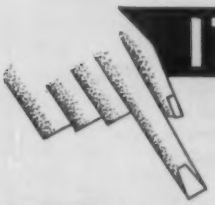
It depends upon the type of plastics or composition sheets you are using. With some of them you can get a smooth, clean, accurate cut, and of course, shearing is much faster.

But, it may take a bit of testing to find the combination of features that will give you the results you want. Wysong will gladly make these tests for you — without cost or obligation.

Send a sample of your material to be sheared to Wysong. You'll receive their engineers' recommendations, plus a sample cut of your own material.

Wysong builds a complete line of power, air-power, and foot-power squaring shears. Write for full information.

IT'S EASIER TO HOT STAMP ON PLASTICS WITH GENERAL LUSTROGOLD



24 Karat Gold Leaf

Its extra brilliance and greater durability make more and more manufacturers turn to LUSTROGOLD genuine gold leaf. LUSTROGOLD is ideal for hot stamping on plastic because it provides finer definition . . . superior coverage . . . easier work-ability.

Also complete assortment of colors as well as imitation gold and silver.

Immediate Delivery and Service from Warehouses in principal cities Coast-to-Coast.

Free Samples and Illustrated Literature Available on Request

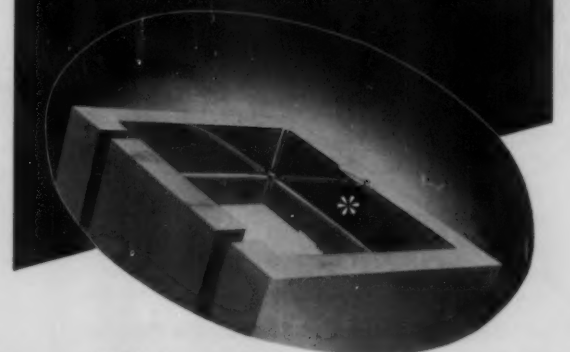
GENERAL ROLL LEAF MANUFACTURING CO.

Genuine and Imitation Gold and Silver, Pigment and Metallic Colors

85-03 57th Ave. Elmhurst, L. I., N. Y. HAvermeyer 9-6123

BOSTON • CHICAGO • LOS ANGELES

Precision's Mold Polishing Imparts *Mirror-Sheen* Lustre*



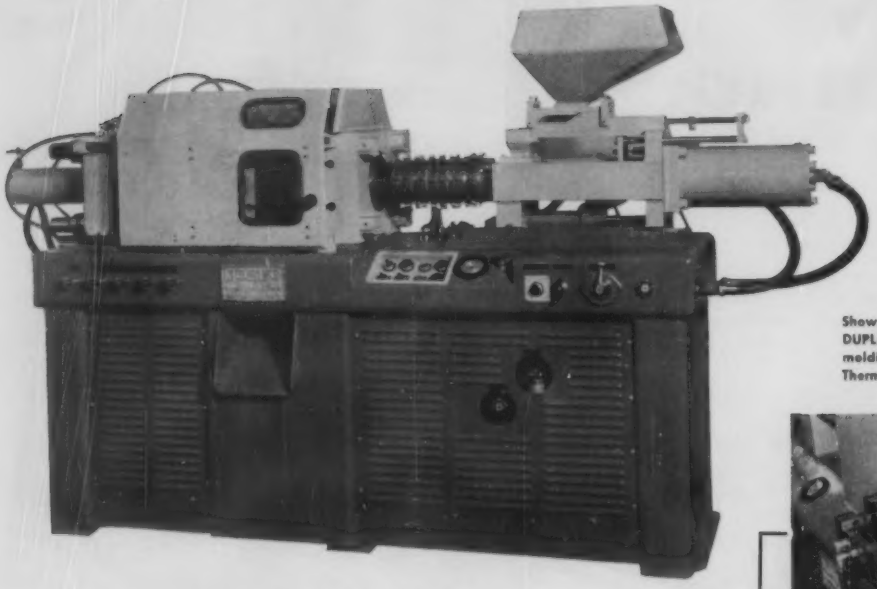
Molded parts gain unsurpassed clarity of finish in every detail from our process of mirror-finish mold polishing. We check all drafts and tapers, insuring proper radii. Proven procedures assure better cycles, more efficient mold operation and molded parts of super finish. Cost is reasonable, service is prompt. Satisfaction guaranteed.

Submit specifications for quotation.

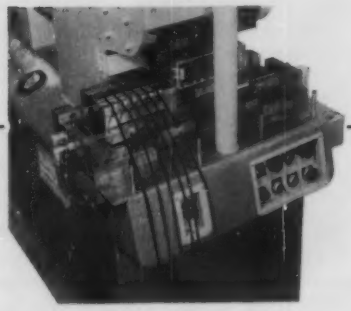
Precision Mold and Polishing CORPORATION

P. O. BOX 322 • ROANOKE, VIRGINIA

The Proven Work Horse of the Plastics Industry



Shown below, the Moslo DUPLIMATIC—A must for insert moldings up to 3 ounces, in all Therme-Plastic materials.



The Fully Automatic

MOSLO 75-8-4

This famous Moslo 4 ounce Injection Molding Machine is setting new highs in production. Actual records show the 75-8-4 outproduces four, 6 ounce machines by 100%, running molds within the capacity of the machine.

Bring your molds to us . . . we'll show you the results, or write today for details.

The Moslo line includes these models, ideally suited for molding all thermo-plastic materials—excellent for nylon and container molding:

Model 74-7—Super 2 ounce with 7" mold stroke.

Model 74-12—Super 2 ounce with 12" mold stroke.

Model 76-8—Super 4 ounce with 8" mold stroke.

Model 11—Famous Duplimatic for insert molding.

BUILDER OF THE WORLD'S FASTEST MOLDING MACHINES

MOSLO MACHINERY COMPANY

2437 PROSPECT AVENUE • CLEVELAND 15, OHIO

energies of the pendulum at the maximum height in free swing and at the level corresponding to the measured time with a sample in place. The results obtained on polyethylene film with this tester correlate with those obtained in bag drop tests.

Determination of urea-formaldehyde resins in coatings via urea analysis. M. H. Swann and G. G. Esposito. Analytical Chem. *28*, 1984 (Dec. 1956). The release of ammonia from urea-formaldehyde coating resins on treatment with alkali is used to provide a rapid quantitative means of analyzing coatings for urea resin modification, or of determining urea in urea-formaldehyde resins.

Chemistry

Pyrolysis of crosslinked styrene polymers. F. H. Winslow and W. Matreyek. J. Polymer Sci. *22*, 315-24 (Nov. 1956). The effect of network density on pyrolysis of polymers and copolymers of styrene, divinylbenzene, and trivinylbenzene was studied over a wide range of temperature. Thermal stability of polymers and size of carbon residues increased with crosslink concentration as volatilization rates declined. Rate of gas evolution was dependent on particle size, but was unaffected by catalyst content and moderate pressure changes. The results indicate extensive alteration of monomer units, possibly by a hydrogen transfer process which favors carbon formation rather than vaporization.

Publishers' addresses

A.S.T.M. Bulletin: American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.

Analytical Chemistry: American Chemical Society, 1155 Sixteenth St., N. W. Washington 6, D. C.

British Plastics: Iliffe and Sons, Ltd., Dorset House, Stamford St., London S. E. 1, England.

Industrial and Engineering Chemistry: American Chemical Society, 1155 Sixteenth St., N. W. Washington 6, D. C.

Journal of Applied Chemistry: Society of Chemical Industry, 56 Victoria St., London S. W. 1, England.

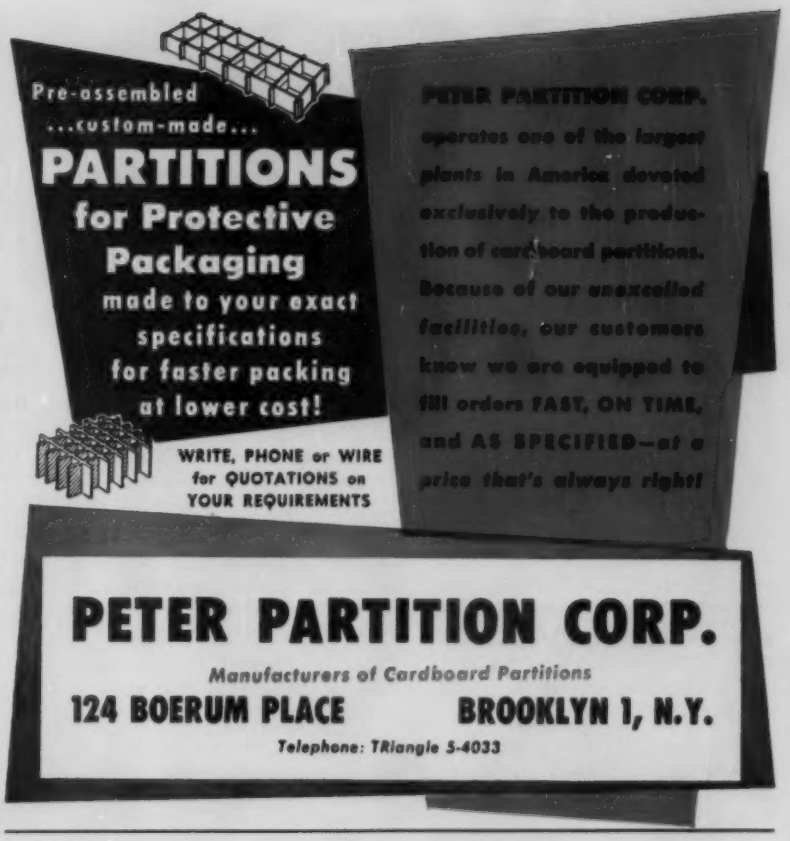
Journal of Polymer Science: Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y.

Materials and Methods: Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.

Modern Packaging: Modern Packaging Corp., 575 Madison Ave., New York 22, N. Y.

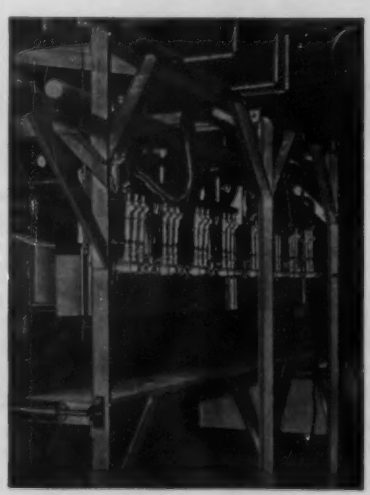
Research and Engineering: Relyea Publishing Corp., 103 Park Ave., New York, N. Y.

SPE Journal: Society of Plastics Engineers, Inc., 513 Security Bank Bldg., Athens, Ohio.


Pre-assembled
...custom-made...
PARTITIONS
for Protective Packaging
made to your exact specifications for faster packing at lower cost!
WRITE, PHONE or WIRE for QUOTATIONS on YOUR REQUIREMENTS
PETER PARTITION CORP. operates one of the largest plants in America devoted exclusively to the production of cardboard partitions. Because of our unexcelled facilities, our customers know we are equipped to fill orders FAST, ON TIME, and AS SPECIFIED—at a price that's always right!
PETER PARTITION CORP.
Manufacturers of Cardboard Partitions
124 BOERUM PLACE BROOKLYN 1, N.Y.
Telephone: TRiangle 5-4033

Don't risk web damage!

FUSE AND CURE COATINGS with the DAWSON VAPO-FUSER®



Unit shown here is raised. This prevents injury to material when the web is stopped.

The Dawson Vapo-Fuser delivers an evenly-distributed flow of low-pressure heated steam or air over the entire width of the coated film. The temperature of the hot vapor can be maintained accurately at any point from 300° F. up to 900° F. Heat transfer efficiency is very high, and the entire coating is completely fused without damage to the web material.

Because of its unique patented method of delivering hot vapors, the Vapo-Fuser requires only one-third to one-quarter the space of some other types of equipment. For complete safety, the Vapo-Fuser is equipped throughout with explosion-proof fittings.

Write for our catalog that gives full additional information.

F. C. DAWSON ENGINEERING CO. / Canton, Massachusetts

U.S. Plastics Patents

Copies of these patents are available from the U.S. Patent Office, Washington, D. C., at 25¢ each

Molding. B. D. Miller (to National Cylinder Gas). U. S. 2,774,104, Dec. 18. Machine for dispensing and molding plastics.

Molding. E. C. Bernhardt (to Du Pont). U. S. 2,774,105, Dec. 18. Extrusion—extraction apparatus.

Extrusion. B. H. Davis (to Standard Machinery). U. S. 2,774,107, Dec. 18. Extrusion apparatus.

Heat treating. H. S. Kaufman (to M. W. Kellogg). U. S. 2,774,109, Dec. 18. Heat-treating process for trifluorochloroethylene polymers.

Extrusion. J. M. Walters (to Electro-Chemical Engineering). U. S. 2,774,110, Dec. 18. Extrusion of furane resins.

Soil conditioners. G. Abel and T. Volker (to Rohm and Haas). U. S. 2,774,659, Dec. 18. Polymers of urea and unsaturated acids.

Trim panels. A. A. Killington (to Briggs). U. S. 2,774,700, Dec. 18. Laminated trim panels.

Laminates. R. A. Smith (to M. W. Kellogg). U. S. 2,774,702-4-5, Dec. 18. Lamination of perfluoro-chloroolefins and polyacrylonitrile.

Resins. J. P. Shelley (to Rohm and Haas). U. S. 2,774,746, Dec. 18. Condensates of diethylene glycol and bis-carbamate-formaldehyde.

Cements. H. Wolfson and G. Elliott (to International Standard Electric). U. S. 4,774,747, Dec. 18. Electrically conductive cements containing epoxy resins and silver.

Resin. H. W. Howard and C. V. Wittenwyler (to Shell). U. S. 2,774,748, Dec. 18. Composition containing an epoxide resin.

Resins. L. N. Stanley and A. C. Baggenstoss (to General Aniline). U. S. 2,774,749, Dec. 18. Dicyandiamide-formaldehyde condensates.

Wrinkle finish. J. Fletcher (to National Research). U. S. 2,776,225, Jan. 1. Producing a highly reflective wrinkle finish by coating successively with phenyl methyl siloxane resin, vaporized aluminum, and phenyl methyl siloxane resin.

Polymers. H. J. Passino, A. L. Dittman, and J. M. Wrightson (to M. W. Kellogg). U. S. 2,774,751, Dec. 18. Fluorine—containing polymers.

Cellular articles. J. L. McCurdy and C. E. DeLong (to Dow). U. S. 2,774,991, Dec. 18. Process for molding shapes of cellular plastics.

Strap. A. Kundert. U. S. 2,775,093, Dec. 25. Detachable link strap of plastic material.

Cellulose esters. H. Bates, C. W. Sammons, and J. W. Fisher (to British Celanese). U. S. 2,775,529, Dec. 25. Manufacture and use of cellulose triacetate.

Resins. S. B. Wiczer, U. S. 2,774,563, Dec. 25. Resinous condensates from hydrocarbon dihalides and alloys of an alkali metal with a heavy metal.

Dispersion. C. D. Dipner, W. O. Teeters, and J. M. Wrightson (to M. W. Kellogg). U. S. 2,775,569, Dec. 25. Dispersion of fluorocarbon polymers.

Resins. J. P. Buckmann (to Union Oil). U. S. 2,775,571, Dec. 25. Amide-aldehyde resins.

Plastic. C. F. Fish (to U. S. Rubber). U. S. 2,775,572, Dec. 25. A hard high-impact composition of polyvinyl acetal and ethyl acrylate elastomer.

Copolymers. R. J. Slocombe and G. L. Wesp (to Monsanto). U. S. 2,775,574, Dec. 25. Acrylonitrile copolymers stabilized with cinnamic acid.

Resins. G. P. Hamner and T. G. Jones (to Esso). U. S. 2,775,575-6, Dec. 25. Petroleum resins.

Resins. H. G. Schneider and P. W. Brakeley, Jr. (to Esso). U. S. 2,775,-577, Dec. 25. Controlled isobutylene polymerization.

Catalysts. G. S. Fisher and L. A. Goldblatt (to U. S.). U. S. 2,775,578, Dec. 25. Polymerizations initiated by saturated cyclic terpene peroxides.

Polymerization. M. Erchak, Jr. and R. J. Blazek (to Allied Chemical). U. S. 2,775,579, Dec. 25. Low temperature polymerization.

Polyethylene. R. E. Cairns (to Monsanto). U. S. 2,776,274, Jan. 1. Polyethylene refining.

Pigments. I. Weber and J. H. Basto (to Interchemical). U. S. 2,776,267, Jan. 1. Water-in-oil dispersions of colored spheres of an aminoplast resin.

Resins. H. W. Coover, Jr. and J. B. Dickey (to Eastman Kodak). U. S. 2,776,270-1, Jan. 1. Controlled preparation of polyacrylonitrile.

Resins. M. T. Harvey (to Harvel). U. S. 2,776,272, Jan. 1. Furfural-ketone resins.

Film. M. A. Chavannes (to Chavannes Industrial Synthetics). U. S. 2,776,451-2, Jan. 8. Embossing thermoplastic film.

Tetrafluoroethylene. J. C. Smith (to Du Pont). U. S. 2,776,465, Jan. 8. Oriented shaped tetrafluoroethylene article.

Tumbler. E. S. Tupper. U. S. 2,776,-691, Jan. 8. Double-walled plastic drinking tumbler.

Ethyl cellulose. W. C. Brown (to Hercules). U. S. 2,776,904, Jan. 8. Emulsions of ethyl cellulose.

Reinforced plastics. P. W. Erickson and I. Silver (to U. S.). U. S. 2,776,910, Jan. 8. Coating fibrous glass with a reaction product of an organo halosilane and a glycidol derivative and then with epoxy resins.

Coating. G. P. Gregory (to Hercules). U. S. 2,776,911-2, Jan. 8. Coating paper with a salt of cellulose sulfate.

Coated stones. R. C. Faulwetter. U. S. 2,776,914, Jan. 8. Stone particles to be used in a concrete mixture, coated with chlorinated rubber.

Coating. F. C. Bersworth (to Dow). U. S. 2,776,918, Jan. 8. Coating for metal containing a chelating agent.

Acrylonitrile. M. R. LyHon, E. A. Wielicki and E. Lewis (to American Viscose). U. S. 2,776,946, Jan. 8. Plasticized acrylonitrile polymers.

Polymers. C. E. Schildknecht (to Celanese). U. S. 2,776,947, Jan. 8. Dispersions of acrylonitrile-N-vinyl lactam copolymers.

Resins. F. H. Snyder (to Dendrol). U. S. 2,776,948, Jan. 8. Resins from hydroxymethyl furfural and phenols.

Why Parker O-rings seal better and last longer!

For trouble-free leakproof sealing, you can depend on precision-molded Parker O-rings. Laboratory and service tests check every detail of the manufacturing process. Precision-molding by exclusive methods assures accurately sized O-rings. And we have molds for over 296 standard O-ring sizes!

From Parker you get exactly the *right* O-ring for your *specific* application. We invite you to prove by comparison tests how Parker O-rings seal better and last longer. Our engineering service will be glad to help you with designing problems. Mail the coupon or ask your Parker O-ring distributor for catalog.

Parker
Hydraulic and fluid system components

RUBBER PRODUCTS DIVISION
Section 521-P
The Parker Appliance Co.
17325 Euclid Ave., Cleveland 12, Ohio

☐ Please send O-ring Catalog No. 5701

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

New Machinery and Equipment

Sheeting slitter

A new 18-in. bench model slitter slits any-gage sheeting that has a modicum of stiffness, e.g., cellophane, leatherette, paper, acetate, Teflon, etc. Parent rolls up to 18 in. wide and 12 in. in diameter with cores from 1.5 to 3 in. can be handled. Operating on the single-rewind principle, it slits to widths as narrow as ⅛ in., has sealed ball bearings, simple tension controls. The machine loads, threads, slits, rewinds, and adjusts from the front, comes complete with 3-speed motor. *Doven Machine & Engineering, Inc., 2706 W. Van Buren St., Chicago 12, Ill.*

Finishing barrels

A double barrel finisher in which two barrels are mounted one above the other to save space, has a 2.5-hp. motor for each barrel. Made of sheet metal lined with maple, the barrels can each be divided into two compartments; they measure 30 in. in diameter by 42 in. in length. Smaller barrels are available.

A companion unit is a single-barrel screen deflasher driven by a ½-hp. motor, which has a perforated metal barrel 30 by 36 inches. *H. W. Kramer Co., 120-30 Jamaica Ave., Richmond Hill 18, N. Y.*

*Specifications and claims made and appearing in these pages are those of the manufacturers of the machinery and equipment described and are not guaranteed by MODERN PLASTICS.

Beside-the-press grinders

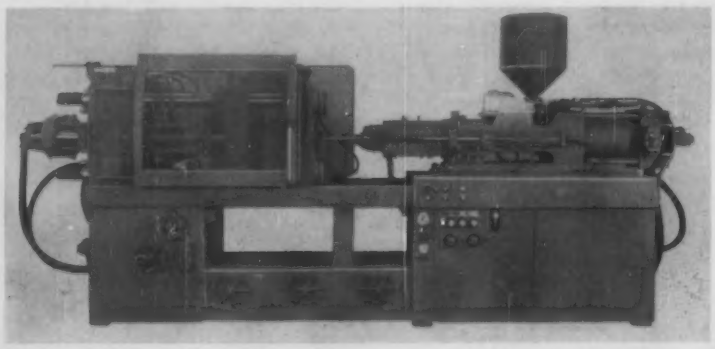
Models 3X and 3XX of the new foremost grinders have extra-large throats and are especially designed for grinding scrap molded parts as well as trimmings from thermo-formed sheet. The 3X has a throat opening of 10 by 16 in. and is powered by a 5-hp. motor, while the 3XX has a throat opening of 10 by 24 in. and has two 5-hp. motors. These units, because of their large throats, have also found acceptance in reclaiming defective polyethylene houseware moldings. *The Rainville Co., 224 Seventh St., Garden City, N. Y.*

Injection molding machine

The Impco HAS-275 is an 8- to 10-oz. machine specifically designed for automatic molding of deep-draw parts requiring a long stroke. The stroke, adjustable to 14.2 in., can be reset without upsetting knockout and cushion adjustments. The toggle-type clamping mechanism has automatic spray-mist lubrication with fail-safe controls, while molds are protected by having a low pressure on the ram at closing. The machine has a centralized water system, so that only one supply and drain are needed. General specifications are:

Injection:	
Rate, cu.in./sec.	15
Oz. per shot	8 to 10
Max. press., p.s.i.	23,000
Dry-cycle time, sec.	4.8
Clamping:	
Max. mold size, in.	16.8 by 27
Daylight, in.	7 to 18
Nbr. knockout points	17
Top clamping force, tons	275
Heating cylinder:	
Nbr. control zones	3
Plasticating capacity, lb./hr.	100
General:	
Motor, hp.	30
Pump capacity, gal./min.	51
Line pressure, p.s.i.	1750
Over-all dimensions, ft.	
length	15.2
width	4.0
height	7.2

Improved Machinery Co., Nashua, N. H.



Impco HAS-275 for automatic molding of deep-draw parts

Mold bases

Six new standard sizes of mold bases have been announced by DME. In all six, one dimension is 23.75 in., and all are available in a range of heights from 9.9 to 16.4 in. The remaining lateral dimension, for the six bases, is: 14.9, 16.5, 19.5, 23.75, 29.5, and 35.5 inches. Special features: clamp slots to save platen space, tubular dowels that leave more room for coring, stop pins that are welded to the ejector bar, and one-piece, stronger ejector housing. *Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12, Mich.*

Metering pump for two-part resins

The Triplematic 500A and 500G series are designed to proportion, mix, and meter automatically a wide range of two-part resins for potting, foaming, and adhesive uses. Resin viscosities up to 1000 poises can be handled by either, but the A series is designed for curing agent viscosities in the 0.005- to 3-poise ranges while the G series will handle curing agents

Van Dorn

MODEL H-250 PRESS 2½ OZ.

is FAST!

Up to 1200 cycles per hour (dry run)

AUTOMATIC!

One operator can run 3 or more presses, for greater flexibility, and lower labor costs. Selective control permits semi-automatic operation.

EASILY OPERATED!

by semi-skilled help. With simple, handy controls, job can be set up in 20 minutes.

VERSATILE!

The sketches list only a few of the many thermoplastics molded on Van Dorns.

Made at Low Cost on VAN DORNS

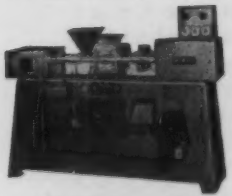
Polystyrene Containers — over 720 per hour

Vinyl Cord Sets —over 2000 per hour

Polyethylene Closures — over 9000 per hour

Nylon Coil Forms — over 2000 per hour

Remember, For the Price of One Large Press, You Can Own a BATTERY of VAN DORNS!



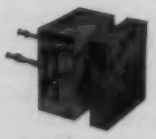
SEMI-AUTOMATIC PRESS 2-oz. capacity.

POWER OPERATED, LEVER CONTROLLED PRESSES 2-oz. and 1-oz. models.

WRITE FOR complete data on model H-250 and other equipment shown.

FINANCING AVAILABLE

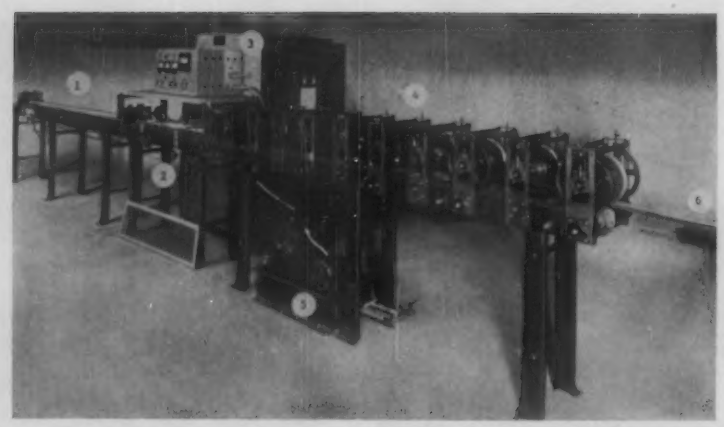
PLASTIC GRINDER Grinds up rejects, waste, etc., for re-use.



MOLD BASES Available from stock.

THE VAN DORN IRON WORKS CO., 2685 EAST 79th ST. · CLEVELAND 4, OHIO

with viscosities ranging from 3 to 800 poises. In the A series, the ratio of curing agent to resin may be varied from 0 to 40 parts per hundred of resin (p.h.r.) with an accuracy of ±1.5%. In the G series the range is different for different models, but together they cover the range from 5 to 100 p.h.r. From 1 to 72 shots per minute may be made, with shot capacities ranging up to 24 ml., and average outputs ranging up to 1720 ml./min. Air is excluded from the system to minimize frothing. *H. V. Hardman Co., 571 Cortlandt St., Belleville 9, N.J.*



Formatron laminate forming machine. 1—air-operated feed unit; 2—h.-f. heating section; 3—h.-f. generator and control box; 4—roll forming and cooling section; 5—variable-speed drive; 6—take-off

Dry-screen circuit printer

The Mark III Junior is a laboratory printing unit useful for printing prototype circuits that may later be produced on a large scale. Panels are printed dry and come off press ready for etching. Either single or double copper-clad laminates can be printed. Effective printing surface is 8 by 14 inches. A larger version having a printing area of 22 by 28 in. is also available. About 200 impressions per hour can be made. A powered semi-automatic model jumps this production to 600 panels per hour. *Dry Screen Process, Inc., 1016 Madison Ave., Pittsburgh 12, Pa.*

Electrical insulation tester

The P-1 tester counts insulation faults (pinholes) in insulated wire at speeds up to 600 ft./min. Voltage may be adjusted from 0 to 250 d.c., and a sensitivity control permits any desired desensitization. The small test current—10 microamp.—assures reliable operation and no shock hazard. *Peschel Electronics, Inc., 9 Garden St., New Rochelle, N. Y.*

Laminate forming machine

A continuous postforming machine for laminates, particularly Formica, utilizes dielectric heating in rolling angles from flat strips of laminates. The machine is capable of producing angles 1 by 1 in. minimum to 4 by 4 in. maximum, up to 10 ft. in length. Operation is said to be completely automatic. The laminate is heated to about 300° F., formed by rollers, and cooled to set the shape. It is possible to bend $\frac{1}{16}$-in.-thick Formica, for example, to a $\frac{3}{32}$-in. radius, with no spring-back, at rates of about 20 ft./min. *Faratron, Inc., 4447 Union Pacific Ave., Los Angeles 23, Calif.*

Spring-loaded thermocouples

Accurate measurement of deep-down barrel temperatures in extruders and molding machines requires excellent contact between the thermocouple junction and the metal surface at the bottom of the hole. Two new spring-loaded, IC couples guarantee this essential contact (as do those of other makers) in spite of thermal expansion and machine vibration. The spring is of Inconel-X, an alloy that withstands temperatures up to 900° F. Protection tubes are $\frac{3}{16}$-in. O.D., 304 stainless, while the flexible extensions (in lengths up to 10 ft.) are also 304, $\frac{5}{16}$ in. in diameter. Depth of hole may be any even quarter inch from 0.5 to 18 in. Two models are available: straight and right-angle bent. *Minneapolis-Honeywell Regulator Co., Industrial Div., Philadelphia 44, Pa.*

Marking machine

The Kensol 60 roll leaf stamping press applies permanent, fine-quality trademarks, decorations, directions, etc., on almost any kind of plastics, including thermosets. It will mark both flat and high (up to 5.5 in.) items and has a wide range of pressures obtained by using two air cylinders in the imprinter drive. (One can be inactivated when making light imprints.) Dwell is electrically timed. Head and roll leaf attachments come in two sizes: 6 by 8 and 8 by 12 in., with larger sizes available on special order. A 6- or 12-station turntable attachment is one of several feeders available. *Olsenmark Corp., 124-132 White St., New York 13, N. Y.*

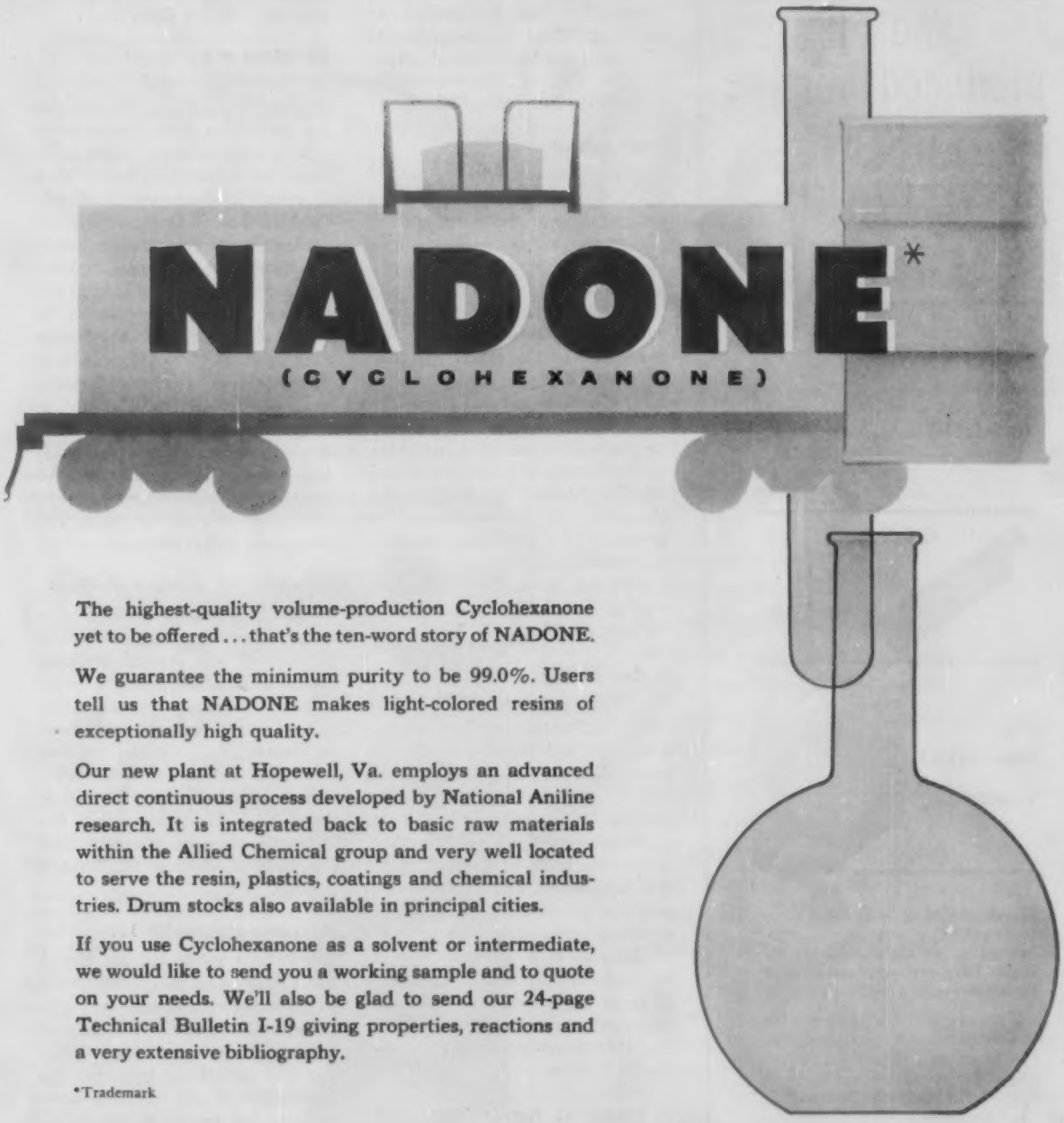
Multipoint recorder

The Wheelco Series 8000 recorders can be used for the permanent recording of up to 16 different temperatures (or other quantities convertible to millivolts) on a 5-sec. cycle (single point). Chart speed in in./hr. is given by: speed = 48/(nbr. of record points). When used with thermocouples the measuring circuit is electronic and automatically balanced. Chart width is 11 in., pointer scale length the same. Sensitivity is 0.1% except at scale spans under 5 mv., when it is 5 μv. Accuracy is ±0.25%. A full selection of scale ranges is available with built-in-cold-junction compensation. *Barber-Colman Co., Wheelco Instruments Div., Rockford, Ill.*

Spray gun for polyesters

The SealZit system is a simple system for the spray application of polyester resins of various viscosities. With the new gun coats of over 20 mils in thickness can be applied in one pass without having to add fillers or sealers to the resin mix. In furniture work, coats 6 to 8 mils thick that will dry in half an hour to an hour may be applied. The maker also

the highest quality you can get in any quantity you can use!



The highest-quality volume-production Cyclohexanone yet to be offered . . . that's the ten-word story of NADONE.

We guarantee the minimum purity to be 99.0%. Users tell us that NADONE makes light-colored resins of exceptionally high quality.

Our new plant at Hopewell, Va. employs an advanced direct continuous process developed by National Aniline research. It is integrated back to basic raw materials within the Allied Chemical group and very well located to serve the resin, plastics, coatings and chemical industries. Drum stocks also available in principal cities.

If you use Cyclohexanone as a solvent or intermediate, we would like to send you a working sample and to quote on your needs. We'll also be glad to send our 24-page Technical Bulletin I-19 giving properties, reactions and a very extensive bibliography.

*Trademark

NATIONAL ANILINE DIVISION

ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

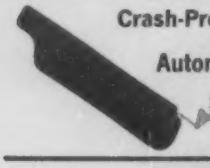
Akron Atlanta Boston Charlotte Chattanooga Chicago Columbus, Ga. Greensboro Los Angeles New Orleans Philadelphia Portland, Ore. Providence Richmond San Francisco Toronto

FAMOUS FIRSTS

...and all produced from PETERSON ELECTRONIC SEALING DIES

Hammond World Globe (inflatable)

Crash-Proof Automobile Sun Visor



Heat-Sealed "Thermo Bag"

Experienced fabricators of vinyl know that trouble-free operation and superior production demand the best in DIES...DIES engineered and made to Peterson's exacting quality standards.

If you now plan new production let us show you how we can work with your engineers... or take over full responsibility for design and development of the electronic heat sealing DIES you need.

Second Generation of Die Makers

Designers, Engineers & Manufacturers of ELECTRONIC DIES and DEVICES

A. W. PETERSON & SONS DIE COMPANY, INC.

131 Prince Street • New York, N. Y.

offers for use with this gun some resins that are specially formulated for long pot life. Resin is supplied to the gun from two separate pots (furnished with the gun) and is sprayed out of twin nozzles; mixing is accomplished ahead of the gun. In about an hour, these resins will dry to a finish that can be sanded or polished. They are available in clear and a wide range of colors. *SealZit Co. of America, 3593 Eighth St., Riverside, Calif.*

Heat sealer

Electronic sealers with outputs of 0.5, 1, 3, and 5 kw. can handle a wide variety of seal patterns. The top of the generator housing is designed to be used as a work table, and the controls and indicating meters are all set into a convenient sloping panel at the rear edge of the table. All four units are designed to operate at 30 to 45 mc., with input power requirements ranging from 1.7 kva. on the smallest machine to 12 kva. on the largest. Any pattern of seal can be obtained by shaping the electrode die. Power control is provided by a variable capacitor, and sealing time is controlled by a 0-20-sec. timer. *Raybond Electronics Inc., 66 Needham St., Newton Highlands 61, Mass.*

Water chiller

The 1-, 2-, and 3-ton chillers that this manufacturer has been marketing are not large enough for some chilling jobs. Now offered are 5- and 7.5-ton models for cooling larger molds, etc. These chillers consist of refrigerating units with built-in air cooling of the refrigerant, and are guaranteed to give rated capacity at ambient temperatures up to 115° F. Because it is air cooled, and recirculates only a small quantity of water, the system requires only electrical connections. *Vic Mfg. Co., 1313 Hawthorne Ave., Minneapolis 3, Minn.*

Dehumidifier for drying ovens

It is known that some molding powers, e.g., nylon-6/6, cannot be dried in standard ovens on hot, humid days. The Dryomatic is a dehumidifier that, attached to a standard drying oven, will reduce the humidity of the air entering the oven to the point at which it can accomplish adequate drying. Using silica gel, the unit is self-regenerating. The Dryomatic is available in two models. The 25CT can be used with ovens holding ten trays or less; the 105P is recommended for larger ovens. *The Rainville Co., 224 Seventh St., Garden City, N. Y.*

Sheeting die

A new center-fed crosshead sheeting die is said to be suitable for extruding most thermoplastics. It consists of an adapter, the manifold, a restrictor bar, a "flow chamber" and one set of adjustable die lips. Wide-land lips are recommended for thicker gages, narrow-land lips for thinner gages. The die is available in slit lengths ranging from 26 in. to 54 in., with thickness adjustments ranging from 10 to 190 mils. It is fitted with Chromalox heaters, completely wired and ready to plug into control equipment. Zoning, number, arrangement, wattage, etc., of the heaters will be made to customer's order. *Johnson Mfg. Co., 229 S. Main St., Chippewa Falls, Wis.*

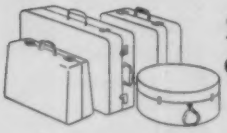
Matching of grained finishes

A timing or registering device makes possible the production printing of any desired graining design at identical positions on all sides of plastic, wood, or metal cabinets. It is optional equipment on Hamant V-27 vertical grainers (see this section for Oct. 1956), and can also be added (at the factory) to V-27 grainers that are currently in use. *Hamant Tool Co., 3936 E. Second St., Dayton 2, Ohio.*

Portable pyrometer kit

The Pandux pyrometer kit, Model 326, provides an inexpensive way to get a portable needle-type pyrometer. It consists of a pair of thermocouple leads, either chromel and alumel, for temperatures up to 2300° F., or iron and constantan, for temperatures up to 1600° F.; a monel protection tube; and a millivoltmeter reading directly in ° F. and ° C. It is easily assembled and adjusted in a few minutes. *Pacific Transducer Corp., 11836 W. Pico Blvd., Los Angeles 64, Calif.*

New Backing Material
FOR LIGHTWEIGHT VINYL SHEETING



Saves Up to 50%
COMPARED TO WOVEN AND NON-WOVEN FABRICS

Already production-proved in a variety of test applications, this new Dexstar long-fibre sheet is now available in quantity for lamination to lightweight, unsupported plastics. Check these important advantages compared to the woven or non-woven fabric you are using now:

- ★ **More uniform thickness** with better fibre distribution
- ★ **One side heat-sealable** thermoplastic fibres — other side highly absorbent fibres for application of adhesives
- ★ **Widths from ¼" to 80"** (including standard 54") in rolls of any length up to 5000 yards
- ★ **Available in either natural or synthetic fibres**
- ★ **Much lower cost** due to our high speed production methods

Send for samples and complete details

Since 1767 DEXSTAR **LONG FIBRE SPECIALTIES**

C. H. DEXTER & SONS, Inc., Windsor Locks, Conn.

LOOK

to Sinko
NYLON
to solve your
Molded Parts Problems

Especially those small, intricate shapes that require certain unique properties found only in Sinko NYLON. Such as: Toughness; Light Weight; Resilience; Resistance to Heat, Wear, and Abrasion; Electrical Insulation; Quiet Operation; Self-lubrication.

Here are but a few of the many and varied applications of Sinko NYLON moldings:

- Bearings, Washers
- Coil Forms
- Connectors
- Gears, Insulators
- Rivets, Screws
- Rollers, Valve Seats
- Wearing Surfaces

Let us make test samples of your parts from Sinko NYLON or other Thermoplastic; or if you prefer, we'll send you the raw material.

Note: Nylon rivet shown molded for Illinois Tool Works

SINKO MANUFACTURING & TOOL CO.
7310 W. WILSON AVE. • CHICAGO 31, ILL.

IF YOU USE

DRY COLORANTS

OVER 100 YEARS EXPERIENCE IS AT YOUR SERVICE!

Continuous consultation with leading molders who depend on our self-measuring, foolproof colorants is your best assurance of employing the most advanced techniques for integrating color and plastic ready for molding.

Our PLASTELS are meeting with wide acceptance by food, drug and cosmetic packaging media. They meet every specification of the various departments of the Food and Drug Administration.

H. KOHNSTAMM & CO. Inc.

Experts in Color Technology for More Than a Century
89 Park Place, New York 7 1-13 Illinois Street, Chicago 11
2632 East 54 Street, Huntington Park, California
Branches in other principal cities of the U. S. A. and throughout the world

Books & Booklets

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Textbook of Polymer Chemistry"

By Fred W. Billmeyer, Jr.
Published in 1957 by Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. 518 pages. Price: $10.50

Dr. Billmeyer has enjoyed for some years the mixed position of being both a teacher of polymer science and a member of a plastics research organization. In his second (and principal) job, he has been constantly exposed to the problems of plastics processing and application. This exposure has led to the inclusion in this book of much material not in the realm of chemistry. The contents of the book can be divided into two domains: 1) physical chemistry and polymerization kinetics and 2) physical structure, properties, and applications of plastics, fibers, and elastomers. The latter is essentially plastics technology with particular attention to the chemical aspects. Attention, in this section, is confined to the polymers of industrial importance (except certain natural resins).

The physical chemist entering the field of plastics will find this book an excellent introduction to the field, and he will find much interesting information that is, perhaps, more in the domain of the engineer and designer. The organic chemist may prefer Fawn or Meyer (Vol. IV of the publishers' High Polymer Series).

"Quality Control for Plastics Engineers"

Edited by Lawrence M. Debing
Published in 1957 by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 142 pages. Price: $4.95

The eight authors of this work, the first in a series of S.P.E.-sponsored books on various aspects of plastics engineering, have produced the first primer of quality control specifically pointed toward the plastics industry. The approach is kept simple throughout, and nothing more than a good command of arithmetic is needed to put to work most of the statistical methods discussed. Beginning with the use of frequency distributions in plastics molding, the chapters continue: the normal frequency distribution, control charts scaled quantities, control charts for yes-no quantities, specifications and tolerances, sampling inspection, correlation, process capability analysis, significance, and a chapter presenting some of the advantages of using statistically based designs in plastics processing experiments. The book suffers from some of the limitations of making things simple (e.g., 3-σ limits for control charts are introduced rather arbitrarily, and it is not until the later chapter on sampling inspection that the cost aspects of risk are considered), but these are far outweighed by the intelligibility of the book to anyone from the molding foreman to the purchasing agent to the plant manager.

"Handbuch der Nitrocelluloselacke, Part 1"

By Dr. Alfred Kraus
Published in 1956 by Wilhelm Pansegrau Verlag, Uhlandstr. 102, Berlin Wilmersdorf, Germany. 323 pages. Price: DM 39.60 (ca. $9.50)

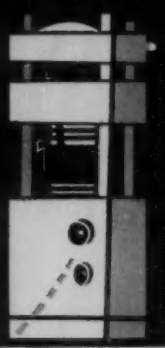
The present volume constitutes a concise summary of the most important portions of the vast literature on solvents for nitrocellulose. It describes the properties of solvents and their application in the field of nitrocellulose lacquers from the standpoint of practical utility, with special stress on their behavior in commonly used mixtures. Theoretical considerations and literature references, although covered, are kept to a minimum. Chapters on the following topics are included: viscosity, solvating action of solvents for nitrocellulose, thinnability; esters, ketones, glycol derivatives, furan derivatives, special solvents, alcohols, ethers, hydrocarbons, halogenated hydrocarbons; behavior of solvents; the physical and chemical bases of the solvating process, evaporation, speed of solvating, and tradenames.

Emulsifiable polyethylene. Revised brochure on emulsifiable A-C polyethylene gives typical properties, physical properties, and emulsifiers for A-C Polyethylene 629, a wax-like polymer with a melting point in the range 208 to 212° F. Also discussed are typical emulsion floor and automobile polishes, preparation of basic emulsions, and current industrial applications. 24 pages. *Semet-Solvay Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.*

Structural adhesive bonds. Wright Air Development Center Technical Report 54-231 Part 4, "Development of Non-Destructive Tests for Structural Adhesive Bonds," by J. S. Arnold, of Stanford Research Institute, discusses the STUB-meter, an ultrasonic technique for the evaluation of structural adhesive bonds. According to the report, "The behavior of a ferroelectric transducer, when mechanically coupled to a test specimen, is affected by the structural properties of the test specimen." A plausible argument is presented for the existence of a relationship between bond strength and the STUB-meter behavior. 38 pages. Price: $1.25. *Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.*

Sheets, rods, and tubes. Catalog gives price and size information on all types of thermosetting and thermoplastic sheets, rods, and tubes. Included are acrylic, vinyl, phenolic, polyethylene, ny-

The INDUR story ...at NATIONAL TOOL & MFG. CO.



INDUR MOLDING COMPOUNDS ARE A BIG FAVORITE at National Tool & Manufacturing Company, Kenilworth, N. J. One of the nation's prominent manufacturers of electrical wiring devices for industry and the home, NTM uses INDUR Phenolic Molding Compounds because . . .

Production

Uniformity

Colors

Service

- Pitt-Consol's INDUR line of versatile, fast-curing powders can be relied upon for top quality and high speed production . . . whether compression, transfer or automatic molding.
- INDUR is consistent . . . Lot to lot, delivery after delivery, uniform quality prevails—controlled by the most efficient analytical methods and instruments.
- INDUR standard colors of deep lustrous black and rich NEMA brown provide widest merchandising appeal. Other colors are available on special order.
- Pitt-Consol's highly qualified technical service is as near as your telephone . . . Adequate stocks conveniently located assures prompt delivery.

"CURE WITH INDUR"

Investigate the advantages of INDUR in your operation. For more information, samples, specification data—please write

PITT-CONSOL
CHEMICAL COMPANY
191 DOREMUS AVE., NEWARK 5, N. J.

A SUBSIDIARY OF PITTSBURGH CONSOLIDATION COAL COMPANY

From Designing to Final Inspection... Over 35 Years of Specialization Assures the Quality of Your Plastic Components

Mack Custom Molding Service

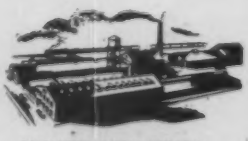
Includes the facilities of three completely equipped plants. Mack design and production engineers are familiar with the problems involved in molding intricate precision industrial parts and functional components for consumer products.

From Blueprint to Delivery

Mack will work with you from the planning stage right through to final delivery. For assistance on specific requirements, just call or write: Mack Molding Company, Inc., Wayne, New Jersey.

Serving Industry for Over 35 Years

Three plants to help with your plastic problems:

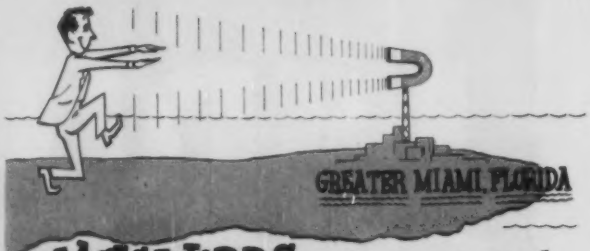


•WAYNE, NEW JERSEY

•ARLINGTON, VERMONT

•WATERLOO, P.Q., CANADA

MACK Molded Excellence



MAGIC WORDS when you need critical personnel

Greater Miami manufacturers—there are over 1700 prospering here now—find they can select just the engineers...skilled technicians...office and plant workers needed from a constant flow of applications from all over the country. Their employees produce better, too...working where they want to live.

That's why we say, "There's a Hard Dollar Reason for Locating Your Plant in Greater Miami."

For the complete story on Greater Miami as a possible location for your plant—send, on your letterhead, for 30-page Fact File—**complete statistical area analysis.**

GREATER MIAMI
INDUSTRIAL DIVISION
Dade County Advertising Dept. 196 • 141 N.E. 3rd Ave. • Miami, Fla. • Phone FR 1-3611

ORGANIC PEROXIDES

LUPERSOL® DDM

60% METHYL ETHYL KETONE PEROXIDE IN DIMETHYL PHTHALATE

WATER WHITE LIQUID

11% ACTIVE OXYGEN

LOW TEMPERATURE CATALYST FOR POLYESTER RESINS

WAREHOUSE STOCKS CONVENIENTLY LOCATED THROUGHOUT THE COUNTRY

®REGISTERED TRADE MARK

LUCIDOL DIVISION
WALLACE & TIERNAN INCORPORATED
BUFFALO 5, NEW YORK

Get New Data on all 3 Infrared Heating Units!

Get New Bulletins Now!

Whether you select components or complete ovens for swift, safe, sure processing . . . your one source of radiant equipment for all three sources of infrared heat is the pioneer manufacturer . . . *Fostoria.* Get better acquainted with this modern low-cost way to heat, dry, cure, bake and finish products, materials and parts. Write now and ask for "All 3 Infrared Bulletins." Address:

FOSTORIA PRESSED STEEL CORPORATION
Dept. 431 Fostoria, Ohio

INTERPLASTICS CORPORATION

- *buyers* of Plastics Scrap and Surplus Molding Powders
- *suppliers* of Polystyrene, Polyethylene, Vinyl, Cellulose Acetate, Nylon and all other thermoplastics.
- *export and import* A department with complete world wide service

GERALD F. BAMBERGER, *President*
120 East 56th St., New York 22, N. Y., U. S. A.
Tel: PLaza 1-4280 Cable Address: INPLAKO

OUR ONLY FUNCTION IS TO SAVE YOU MONEY

lon, Teflon, and Kel-F products. Acrylic fade-resistant coatings, and miscellaneous products and supplies are also listed. 64 pages. *Commercial Plastics & Supply Corp., 630 Broadway, New York 12, N. Y.*

Plastic tooling. Folder entitled "Why You Should be Using Plastic Tooling in Your Shop . . ." describes and illustrates instances where complicated contours and multiple curves occurred in the tool face—such as are encountered in chucking jaws, draw and form dies, jigs and fixtures, prototype tools and tracing—and shows how the problems were solved with plastic tooling. 4 pages. *Research and Engineering, Inc., 1201 N. Fifth St., Minneapolis 11, Minn.*

Phenolic molding compounds. Physical properties, molding equipment, preforming, preheating, mold temperature, curing time finishing, polishing and buffing, and shelf-life are the subjects of bulletins on Durez 13124 Black, a two-step, flock-filled, extra-high strength medium-impact material in nodular form, and Durez 16274 Natural, a two-step, mineral-filled material with excellent electrical characteristics. 4 pages each. *Durez Plastics Div., Hooker Electrochemical Co., North Tonawanda, N. Y.*

Teflon tape. Folder gives uses, properties, and prices of Temp-R-Tape, a pressure-sensitive Teflon tape for Class H insulation and non-stick facing. 4 pages. *The Connecticut Hard Rubber Co., 407 East St., New Haven, Conn.*

Radiant heat. Problems of plastics processing plants, that could be solved with the use of radiant equipment, are described and illustrated in a new booklet. 8 pages. *The Fostoria Pressed Steel Corp., Fostoria, Ohio.*

Distribution systems for lubricators. Bulletin 4A describes and illustrates distribution systems for all types of automatic lubricators offered by the company. Following a system from oil reservoir to lubrication point, the booklet tells how and where to obtain the best results. 12 pages. *Bijur Lubricating Corp., 151 W. Passaic St., Rochelle Park, N. J.*

Modified polystyrene. Kleestron Super 44, a rubber modified polystyrene thermoplastic injection molding material for use where strength is of prime importance, is described in a new folder which discusses tolerances, properties, stability, and molding. 8 pages. *Kleestron Ltd., West Halkin St., Belgrave Sq., London, S.W. 1, England.*

Acetal resin. Folder contains a description, and lists uses, properties, and fabrication of a general purpose injection molding resin, and a general purpose extrusion resin. According to the folder, the resin has a combination of chemical and physical properties that suit it for many industrial and consumer uses whose requirements cannot be met by any other thermoplastic. If its field evaluation program

GRC

INJECTION MOLDING TECHNIQUES OFFER WIDE FLEXIBILITY AT IMPORTANT SAVINGS!

Gries' tiny thermoplastic parts meet simple or intricate specifications precisely, uniformly, and economically. We mold all thermoplastics! Nylon, Kel-F, acetates, polystyrene, polyethylene, etc. Quantities of 25,000 to millions.

SMALL PLASTIC PARTS

NYLON A SPECIALTY! Gries' unique special molding facilities make the most of nylon's unique advantages—at the least cost!

AUTOMATIC INSERT MOLDING. Exclusive facilities for individual or continuous inserts; finished parts produced automatically—without manual labor of any kind!

MAXIMUM SIZE: .03 oz. 1¼" long

NO MINIMUM SIZE!

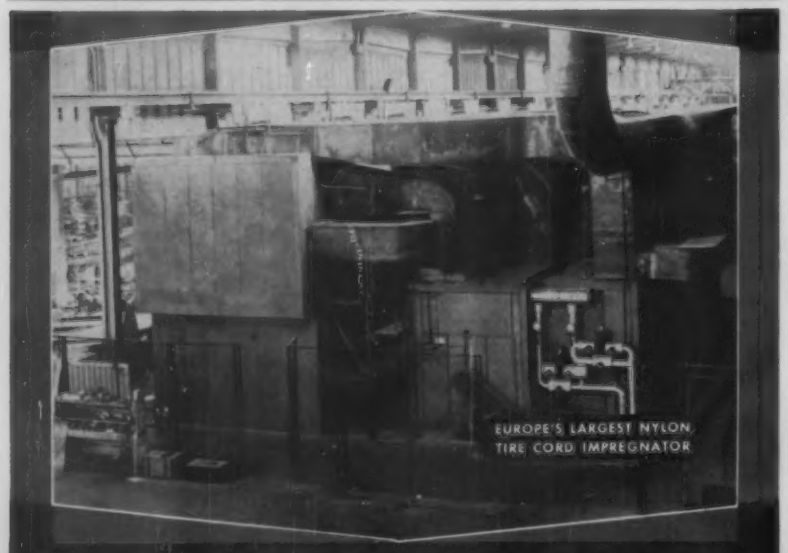
Write today for samples and informative bulletins; send prints for quotations.

See GRC at Booth 421 • Design Engineering Show • May 20th to 22nd, N.Y.

GRIES REPRODUCER CORP.

World's Foremost Producer of Small Die Castings

155 Beechwood Avenue, New Rochelle, N. Y. • Telephone: NEw Rochelle 3-8600



CONTINUOUS IMPREGNATING & COATING SYSTEMS

. . . WORLD-WIDE SERVICE . . .

TECHNICAL DATA ON REQUEST: VARNISH, LATICE & RUBBER IMPREGNATION OF FABRICS & PAPERS

C. A. LITZLER CO., INC.

1817 BROOKPARK RD. CLEVELAND 9, OHIO CABLE "CALITZ"

EXPORT REPRESENTATIVE: GILLESPIE & CO. OF N. Y., 96 WALL ST., NEW YORK 5, N. Y.

proves favorable, the polymer will probably be available for unlimited sale in 1959. 4 pages. *Polychemicals Dept., E. I. du Pont de Nemours & Co., Wilmington 98, Del.*

Machine pads. Brochure describes Air-Loc machine mounting pads made of Bakelite vinyl and specially selected sisal and granulated cork. The ingredients used, and the applications and advantages of the finished products are discussed. 12 pages. *Clark-Cutler-McDermott Co., Franklin, Mass.*

Polyurethane foam components. Folder describes Nafil, a resin for making polyurethane foam. Suggested uses, and technical data on acoustical and aging properties, chemical and fire resistance, consistency, density, setting, storage, strength, temperature range, thermal conductivity, and toxicity are included. 6 pages. *Chase Chemical Corp., 3527 Smallman St., Pittsburgh 1, Pa.*

Nylon zipper. Illustrated brochure describes the construction and application of the Waldes Nylon-Zip, a strong and lightweight slide fastener whose chain and tape are made of Du Pont nylon. Its availability, specifications, characteristics, and sizes in terms of Fed. Spec. VF-106 are included. 13 pages. *Waldes Kohinoor, Inc., 47-16 Austel Pl. Long Island City 1, N.Y.*

Corrosion resistant equipment. Catalog C-14 presents information on a number of the company's materials and products. These include polyester glass reinforced plastics, polyvinyl chloride, Teflon, pipe and fittings, valves, pumps, fume duct and fume systems, cylindrical and rectangular tanks, cylindrical and rectangular towers, pressure and vacuum equipment, agitators, cements, high-pressure molding, and engineered process equipment. 34 pages. *Haveg Corp., 900 Greenbank Rd., Wilmington 8, Del.*

Color concentrates. Technical Bulletin No. 160, 3 pages, describes color paste concentrates

for coloring polyester resins. Bulletin No. 340 describes gravure vinyl ink concentrates for printing on vinyl film and sheeting. 2 pages. *Claremont Pigment Dispersion Corp., 39 Powerhouse Rd., Roslyn Heights, L. I., N. Y.*

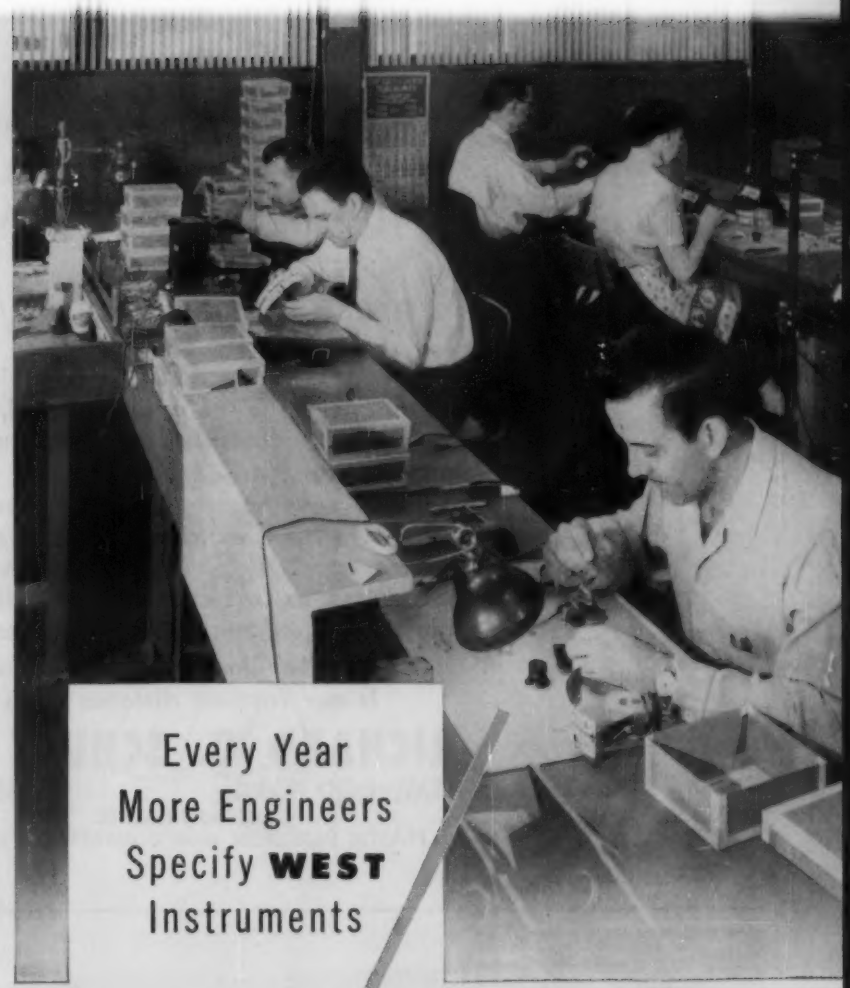
Glass-filled compound. Brochure gives applications and physical, electrical, and chemical properties of Fiberfil Styrene G and Fiberfil Nylon G, glass-reinforced injection molding compounds with improved properties of ruggedness, rigidity, and heat-resistance. 4 pages. *Fiberfil, Inc., Fox Farm Rd., Warsaw, Ind.*

Phenolic molding materials. Catalog tabulates data on Nestorite phenolic molding compounds, making it possible to compare one material against another to evaluate, to a limited degree, the behavior of moldings made from it. 76 pages. *James Ferguson & Sons Ltd., Lea Park Works, Prince George's Rd., Merton Abbey, London S.W. 19, England.*

"Plastics and Resins" gives property data and illustrations of typical products of Beetle urea molding compounds; Cymel melamine molding compounds; Cymac methylstyrene molding compounds; Laminac polyester resins; Cymel, Ketac, Melurac, and Urac resin adhesives; and Cymel laminating resins. 12 pages. *Plastics and Resins Div., American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.*

Packaging. Descriptive folders are available on automatic packaging and wrapping machines, vacuum forming and vacuum packaging machines, and heat sealers and aging blocks. *Product Packaging Engineering, 5747 Marilyn Ave., Culver City, Calif.*

Cost savings. Booklet entitled "Fabricated Parts and Components . . . Management Decision for Profit" sets forth the cost advantages gained by dealing with a single responsible source for fabricated parts made from vulcanized fibre, Phenolite laminated plastics, nylon, and combinations of these materials. Thirty-six illustrations show machining



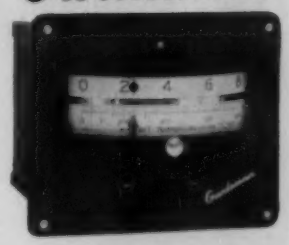
Every Year
More Engineers
Specify **WEST**
Instruments

Why?

This is a section of our new Chicago factory. It was necessary. Previous expansion simply couldn't keep up with growing orders for West *temperature controllers*. Plus demand for the new, allied instruments. On production lines and as components, where efficiency is improved you'll usually find West. Chances are you, too, will be better satisfied with a West Instrument. It costs nothing to find out.

Tell us your application; we'll rush the right data.

Gardsman



WEST *Instrument*
CORPORATION
SALES OFFICES IN PRINCIPAL CITIES
4359 W. MONTROSE, CHICAGO 41, ILL.
British Plant: WEST INSTRUMENT LTD
52 Regent St., Brighton 1, Sussex
Represented in Canada by Upton, Bradeen & James

the trend is to **WEST**

FROM EVERY VIEWPOINT:
IT'S EASY TO SEE
THE ADVANTAGES BUILT IN

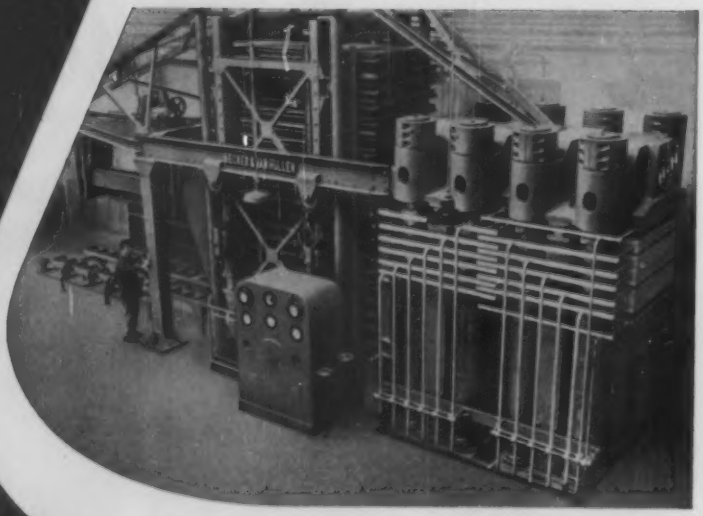
A Perfect Mold

This means that the mold is made with complete accuracy right to the smallest detail, and reproducing the features that win the approval of the most critical eye.

The castings from molds made in our toolroom prove we have matched the pace set by your engineers. They please because they are perfect molds, as perfect as modern skills in a progressive organization can make them.

The phone at your elbow
is our farthest distance from you.

RICHARD O. SCHULZ CO.
ELMWOOD PARK ILLINOIS
DIECASTING DIES
PLASTIC INJECTION AND COMPRESSION MOLDS



HYDRAULIC PRESSES

● Typical of the fine hydraulic presses made by Becker & van Hüllen for over 35 years is this multi-opening laminating press with fully automatic loading and unloading. To meet space limitations, both loading and unloading devices are on the same side of the press.

Do you have a special problem? Becker & van Hüllen builds presses of all styles, dimensions and pressures

Sole U.S. Representative
KARLTON MACHINERY CORPORATION
210 E. Ohio St., Chicago 11, Ill.

BECKER & VAN HÜLLEN / KREFELD GERMANY

operations and products made. Property and application charts are included. 12 pages. *National Vulcanized Fibre Co., 1056 Beech St., Wilmington 99, Del., or, National Fibre Co. of Canada, 107 Atlantic Ave., Toronto, Can.*

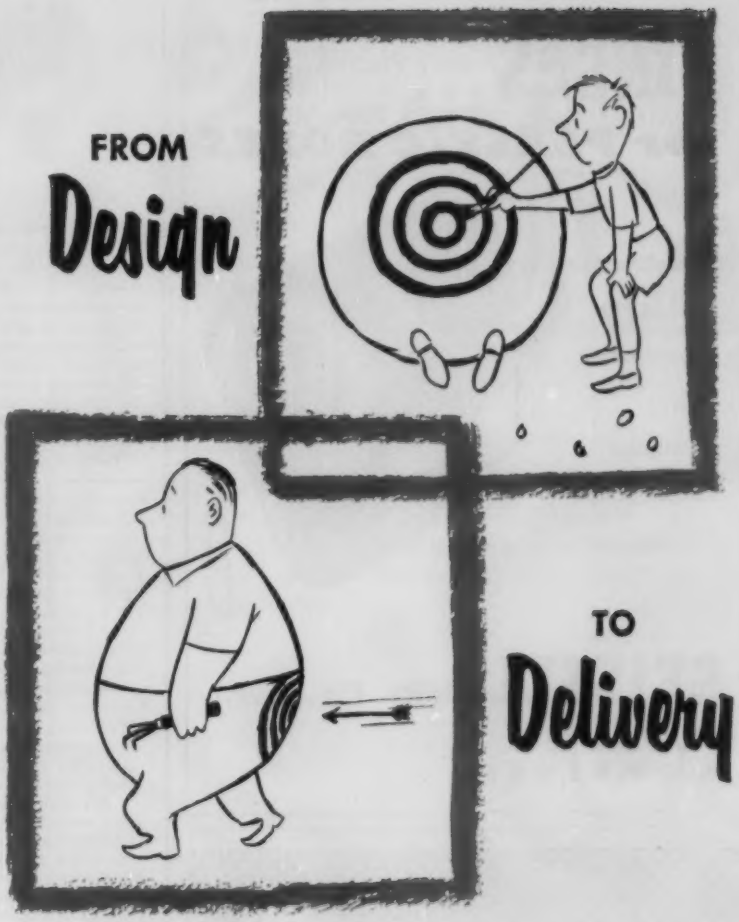
Hopper-dryer, hopper-loader. Bulletin explains and illustrates how the new D & W Hopper-Dryer and new automatic Jet Loader can be adapted to any type of injection or extrusion machine setup. Specifications for a number of units are included. 4 pages. *Thoreson-McCosh, Inc., 18208 W. McNichols Rd., Detroit 19, Mich.*

Color concentrate. Product data sheet on Logo Color Concentrate RV-300, for use on silk screening and roller coating of all plastics except cellulose acetate, lists specifications, uses, applications, standard colors, etc. *Logo, Inc., 13799 S. Avenue "O," Chicago 33, Ill.*

"Dimethylaminoethyl methacrylate," a monomer available in pilot plant quantities, is reported in technical data sheets as to physical properties, toxicity, inhibitor, polymerization, quaternization, copolymerization (with methacrylic acid, methacrylate esters, acrylonitrile, other monomers), other reactions, and suggested applications. 6 pages. *Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa.*

"Molded Fiber Glass" deals with the mechanical, electrical, and chemical properties, as well as design considerations, steps in molding a preformed part, fabrication, painting, connecting, and repairing of the fiber glass reinforced plastics. A number of typical products are shown and described. 16 pages. *Molded Fiber Glass Co., Ashtabula, Ohio.*

Pressure sensitive products. Typical applications and physical characteristics of tapes, adhesives, coatings, etc., for industry are given in "Mystik: The Manual of Pressure Sensitive Products." 70 pages. Price: $2.00. *Mystik Adhesive Products, Inc., 2635 N. Kildare Ave., Chicago 39, Ill.*



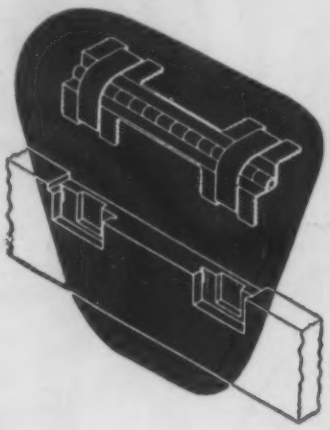
LOOK TO WATERTOWN

From the *right* plastics material . . . by the *right* process — compression, injection, transfer molding, or vacuum forming — we are prepared to produce just the *right* product to meet your most exacting requirements. Our experienced staff of designers, engineers, chemists and production men — working with top-notch equipment and a most modern laboratory — is your best possible assurance of a job well done. For the complete plastics job — from design to delivery — it will pay you to consult Watertown . . . *first!* Just write to . . .

THE WATERTOWN MANUFACTURING CO.
1000 ECHO LAKE ROAD, WATERTOWN, CONN.

HINGES...
for PLASTIC BOXES

press-fit assembly
(Holds like
a drive-screw)
with
or without
double action
"C" Springs



GEISSEL Mfg. Co., Inc.
109 LONG AVENUE
HILLSIDE, N. J., U. S. A.

Custom
Perforating

—on all types of flexible materials, rigid sheets, and foam.

plastics
cellophane
paper
fabrics
rubber

in sheets and rolls up to 72" wide

Whatever your perforating needs, PERFORATING INDUSTRIES has the specialized equipment and know-how to handle the job. Rely on us if you're looking for quality workmanship, prompt delivery, and fair pricing.

Perforating Industries, inc.
310 W. Westfield Avenue. Roselle Park, N. J.
Phone: Chestnut 1-0377

Plastics

Production and sales figures in 1000 lb.* for November and December 1956

Materials	*Total production 1956‡*	*Total Sales 1956‡*
Cellulose plastics:[a]		
Cellulose acetate and mixed ester		
Sheet, under 0.003 gage	19,409	19,629
Sheets, 0.003 gage and over	16,660	16,533
All other sheets, rods, tubes	7,336	7,355
Molding, extrusion materials	92,744	91,720
Nitrocellulose sheets, rods, tubes	5,270	4,836
Other cellulose plastics	5,651	5,158
Phenolic and other tar-acid resins:		
Molding materials[a]	214,248	190,482
Bonding and adhesive resins for:		
Laminating (except plywood)	63,876	44,417
Coated and bonded abrasives	15,207	16,210
Thermal insulation	58,128	55,116
Plywood	44,189	35,613
All other bonding uses¶	51,771	49,416
Protective-coating resins	29,339	25,637
Resins for all other uses	35,441	30,888
Urea and melamine resins:		
Textile-treating resins	40,785	38,897
Paper-treating resins	24,774	23,279
Bonding and adhesive resins for:		
Plywood	102,207	95,494
All other bonding and adhesive uses, including laminating	25,241	23,878
Protective-coating resins	37,250	27,817
Resins for all other uses, including molding	87,167	84,476
Styrene resins:		
Molding materials[a]	434,503	390,801
Protective-coating resins	91,136	87,387
Resins for all other uses	104,414	105,132
Vinyl resins, total[b]	747,487	720,831
Polyvinyl chloride and copolymer resins (50% or more polyvinyl chloride) for:		
Film (resin content)		78,063
Sheeting (resin content)		55,598
Molding and extrusion (resin content)		206,706
Textile and paper treating and coating (resin content)[c]		62,911
Flooring (resin content)		65,384
Protective coatings (resin content)		28,518
All other uses (resin content)		71,859
All other vinyl resins for:		
Adhesives (resin content)		36,565
All other uses (resin content)		115,151
Coumarone-indene and petroleum polymer resin:	245,584	241,846
Polyester resins:	73,016	65,068
Polyethylene resins:	558,374	510,277
Miscellaneous:		
Molding materials[a,e]	43,540	40,636
Protective-coating resins[a]	11,441	5,717
Resins for all other uses[f]	118,097	109,422

*Dry basis designated unless otherwise specified. †Revised. ‡Partially estimated. ¶Includes friction materials. [a]Includes fillers, plasticizers, and extenders. [b]Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production

Production

From statistics compiled by the U. S. Tariff Commission

November†		December‡	
Production	*Sales*	*Production*	*Sales*
1,448	1,581	1,647	1,653
1,379	1,426	1,510	1,550
548	548	567	499
9,291	8,931	8,452	8,794
365	366	317	295
551	481	472	500
15,235	15,257	15,764	13,719
5,250	3,842	4,290	3,033
1,278	1,493	1,408	1,546
5,732	5,356	3,948	3,990
4,777	3,943	2,985	2,310
4,416	4,392	3,759	3,856
2,616	2,053	2,194	2,124
3,456	2,824	3,052	2,838
3,355	3,224	2,794	2,896
2,279	2,424	2,128	1,977
9,284	8,371	7,301	6,960
2,215	2,032	2,195	2,144
3,914	2,914	3,148	2,125
7,136	8,018	6,952	6,389
35,539	31,515	32,068	27,771
7,087	6,555	6,878	4,918
8,928	9,940	9,725	8,788
65,900	65,934	67,870	60,784
	7,002		5,829
	4,774		3,990
	19,895		18,279
	5,888		5,416
	6,253		5,810
	2,639		2,672
	6,128		7,063
	3,115		2,429
	10,242		9,297
21,269	20,697	17,652	17,331
6,542	5,869	6,139	5,683
51,421	48,061	51,413	45,484
4,154	4,220	3,882	3,423
1,335	579	1,063	580
9,823	9,791	9,797	9,236

are given. °Includes data for spreader and calendering-type resins. °Includes data for acrylic, nylon, and other molding materials. °Includes data for epichlorohydrin, acrylic, silicone, and other protective-coating resins. ‡Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

From the World's Largest Production Unit

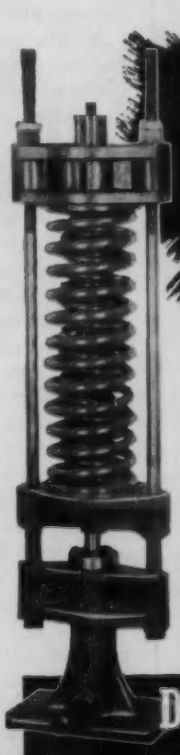
CH_2O

FORMALDEHYDE, MERCK

Unrestricted quantities delivered within 24 hours to points in Middle Atlantic and New England areas. Write, wire or phone your requirements for Formaldehyde 37% and 45% Low Methanol (Uninhibited), and Inhibited; Hexamine Technical, Powder or Granular.

© Merck & Co., Inc.

MERCK & CO., INC.
CHEMICAL DIVISION
RAHWAY, NEW JERSEY



PROTECT Hydraulic Systems from SHOCK

Keep the shock of a quick-closing valve from pounding your hydraulic system to pieces. Avoid unnecessary leaks. Cushion the blow with a Dunning & Boschert Shock Allevistor.

Loosely coiled, nested springs allow a full eight-inch piston travel. Steel tube inside the inner spring prevents buckling. Moving platen is guided by strain rods which are threaded to permit easy adjustment of pressure. Steel cylinder; bronze gland; 2-in. stainless-steel piston.

Here's a sound investment in longer service life—lower maintenance costs. Write for complete information.

Dunning & Boschert PRESS CO., INC.
331 W. WATER ST., SYRACUSE 4, N. Y.

NIAGARA SECTIONAL *Aero* HEAT EXCHANGER gives close temperature control, saves you LABOR, Power, Water

- **Because the new design improves the heat transfer to the out-door air by evaporation.**
- **Because new features keep your equipment working for long life with "new plant" efficiency . . . always full capacity.**
- **Because you save 95% of cooling water cost.**

You get faster, more accurate cooling of industrial fluids to specified temperatures.

You improve your quality of production by removing heat at the rate of input.

You save labor in upkeep. With full access to all interior parts and piping you see everything in easy inspections. You head off dirt accumulation and corrosion. Casing panels are removable without moving the coils. The coils can be cleaned from both sides.

First cost is low; freight is low because of the lowest space/weight ratio; you save much labor in erection. Capacity range is 7,000,000 to 18,000,000 Btu/hr. No other heat exchange method gives you so much saving in money and convenience.

Write for Niagara Bulletin No. 132

NIAGARA BLOWER COMPANY
Dept. ML-4, 405 Lexington Ave.
NEW YORK 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada

Model of proposed United States pavilion for Brussels World's Fair in 1958. Roof (3000 sq. ft.) and curtain walls (42,000 sq. ft.) are designed in plastics

What plastics will star at the Brussels Fair?

It is a measure of the eminence plastics have reached in architectural thinking that when the 1958 World's Fair opens in Brussels, Belgium, the United States exhibit will be housed in a structure some of whose major components are designed in plastics.

At the present writing, final choices of specific materials have not yet been made. However, the basic thinking is clear.

As proposed to Howard S. Cullman, U. S. Commissioner to the Brussels World's Fair, by architect Edward D. Stone, the U. S. pavilion is a handsome two-story circular structure, 340 ft. in diameter and 95 ft. high. The roof consists of an outer compressive rim connected with an inner metallic ring by high-tension steel cables. The outer rim rests on two concentric rows of gilded steel columns. There will be no columns inside the circle.

The entire roof covering the central open space—an area of approximately 3000 sq. ft.—will consist of a fire-resistant, waterproof, translucent plastics dome.

Plans call for this dome to be made of plastics-faced sandwich plaques, 4 in. thick, 4 ft. wide, and 10 ft. long, which will rest on top of the steel cables and be attached to I-beam perlons by means of clamps. An epoxy-impregnated tape will be bonded over the joints where the plaques meet. Another possibility involves sections consisting of aluminum frames faced with reinforced polyester panels. Joints would be made with aluminum extrusions and gaskets.

Around the outer periphery of the pavilion—a circumference of about 1000 ft.—the design envisages a series of hanging nonstructural, fire-resistant, waterproof screens, each 42 ft. high, arranged so as to form a continuous curtain wall. They are intended to give the pavilion its airy, lace-like, light appearance.

This curtain wall is also designed for plastics. The following materials have been and/or are still being considered:

Polyester honeycomb; an 8-in. thick sandwich with plastic core and reinforced plastics face; a decorative aluminum grid backed by heavy vinyl sheet; an aluminum honeycomb with vinyl inserts bonded into the openings to make it watertight; a stainless steel honeycomb, 3 in. wide, with similar inserts; a stainless steel wire mesh with acrylic-polyester copolymer sheet backing; and others.

While details still have to be worked out, it is already evident that the pavilion will be a monument to plastics achievement.

MAYFLOWER METHODS INCREASE PRODUCTION

Quite frequently our technicians are called upon by fabricators to suggest means of perfecting and speeding up difficult plastic sealing operations. By intense application—by designing and building special equipment—we are most always able to raise quality as well as the rate of production.

4 POSTED "C" PRESS

A standard Mayflower press has 18"x30" flat bed; powered by Mayflower 3½kw. generator. Accurate and highly productive in a widely diversified application of tear sealing.

Mayflower ELECTRONIC DEVICES Inc.

Only Manufacturer of both Bar and Rotary Electronic Heat Sealers

HUbbard 9-9400

20 Industrial Avenue Little Ferry, N. J.

MOLD STICKING?

USE

REAL-EASE SILICONE

Release Compound

QUALITY: Highest-Uniform.

EFFICIENCY: Spray tailored for mold release use.

AVAILABILITY: Stocks in key cities.

ECONOMY: Check these prices.

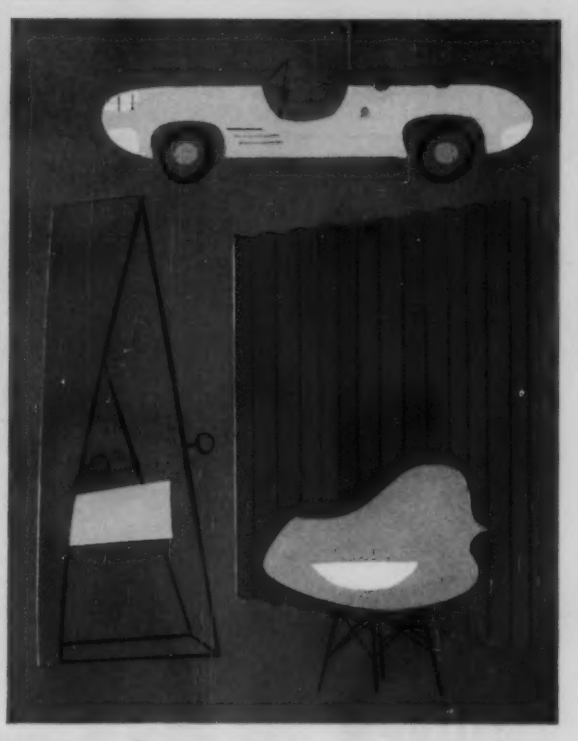
1 to 11 cans	$1.60 per can
1 to 4 cases (12 cans each)	$16.80 per case
5 to 9 "	15.60 " "
10 to 24 "	14.40 " "
25 or more cases	13.20 " "

GIANT 20 OZ. CAN

DON'T DELAY! ORDER TODAY!

BORCO CHEMICALS

3105 N. Cicero Ave. Chicago 41, Ill.



Ferro High-Fidelity colors for

polyester

resins

New Ferro Paste Color Concentrates are developed especially for polyester resins. More stable colors, improved paste vehicles and prompt service are good reasons to standardize on Ferro Colors. Write today for FREE booklets that give you new information on coloring polyester resins.

FERRO CORPORATION

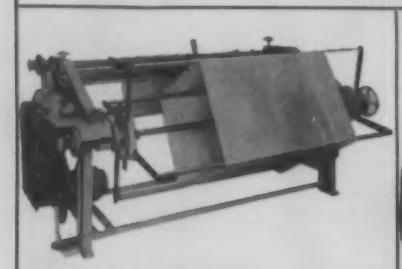
Color Division

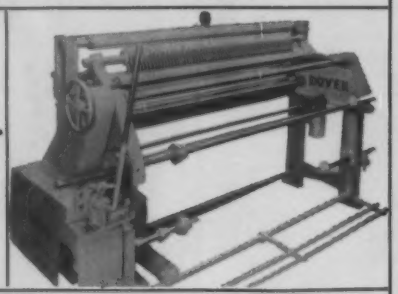
4150 East 56th Street • Cleveland 5, Ohio

5309 South District Boulevard, Los Angeles 22, California

Ferro Enamels (Canada) Ltd., Oakville, Ontario, Canada

FAST, ACCURATE, **SLITTING & SHEETING**
for PLASTICS and all other NON-METALLIC materials!





DRUM TYPE SHEETER

- Expands AUTOMATICALLY from 34" to 120", as required
- Material is DRIVEN OFF—not pulled—eliminating stretch
- Accurate automatic counter
- Ball bearings throughout
- MATERIAL CAN BE SLIT AND SHEETED IN THE SAME OPERATION

15 Different Models

SINGLE REWIND SLITTER

- Will slit as narrow as 1/2"
- Loading, Threading, Slitting and Rewinding from front of machine
- No fusing or interleaving
- Sealed ball bearings throughout
- Rotary or Razor Blade
- Takes rolls up to 18" diameter

Rotary, Razor Blade or Shear Cutters: for slitting PLASTICS, Rubber, Paper, Cellophane Cloth, Acetates, Polyethylene, Aluminum Foil, etc.

Prompt Delivery. Write for prices, all details

DOVEN MACHINE & ENGINEERING CO.
2706 W. Van Buren St. Chicago 12, Ill.
PHONE: SAcramento 2-3355

These Booklets Free!

HANDBOOK ON VACUUM METALLIZING. Illustrated 20-page booklet describes the vacuum metallizing process, discusses its uses. Includes description and specifications of line of vacuum metallizing equipment. F. J. Stokes Machine Company. (D-705)

GUIDING PLASTIC WEBS. Application bulletin describes five models of edge position control devices for use in laminating, printing, embossing, slitting and re-winding plastic film webs of all gages, moving at all speeds. Askania Regulator Co. (D-706)

THERMOPLASTIC SHEET AND FILM. Illustrated folder describes applications for rubber-modified styrene sheet, copolymer styrene sheet, and acetate, butyrate and polyethylene sheet and film. Price lists included. Chicago Molded Products Corp. (D-724)

URETHANE FOAM MANUAL. 16-page booklet tells how flexible and rigid urethane foam is made, illustrates fabricating methods, and discusses applications for insulation, and coatings. Includes sample pieces of flexible foam in several colors. Monsanto Chemical Company. (D-721)

CUSTOM MOLDING SPECIAL PRODUCTS. Folder illustrates New Jersey company's production of special products by slush molding, dipping, pressure molding, foam molding methods. Also describes equipment available for compression, transfer injection molding. Boonton Molding Company. (D-730)

Any of the booklets described here, plus many others—forty-four in all—are available for the asking, without charge or obligation.

Just turn to the Manufacturers' Literature page in this issue (it's printed on heavy paper), circle the numbers corresponding to the booklets you want, fill in the reply postcard, and mail. No postage needed.

We'll see that your requests are routed promptly to each of the companies involved.

A Service Of **MODERN PLASTICS** A Breskin Publication
575 Madison Ave., New York 22, N. Y.

Foam in a tube

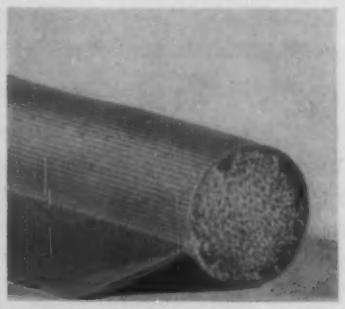
New uses for vinyl tubing, particularly for those applications in which shock absorbency is a prime requirement, are being opened up by the introduction of a new type of tubing filled with foamed-in-place polyurethane. At the present time, the tubing is being used as weather-stripping and as a garage door seal, but the properties which the combination of materials offer appear suitable for a wide variety of other sealing applications.

The jacket of vinyl gives the product very good resistance to abrasion, oil, grease, gasoline, and paint. The polyurethane foam filling offers low density, good thermal insulation, and shock absorbency, as well as resistance to moisture, sunlight, ozone, and mold. It has good plastic memory, and completely recovers its original form after it has been compressed.

In addition to weather-stripping and garage door seals, the foam-filled tubing can be adapted for sealing truck bodies, refrigerator doors, passenger automobile doors, and other applications in boats, railway cars, and airplanes.

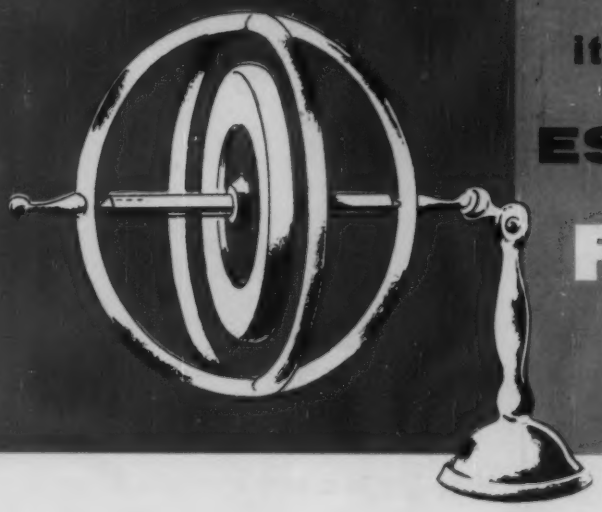
The process for making the tubing is automatic. One man can operate the equipment required for forming the tube (with an integral flange) and curing the foam-filled product. It can be produced continuously, in almost any diameter.

Credit: Foamedge tubing is produced by The Sterling Alderfer Co., Akron, Ohio.



Vinyl tubing filled with foamed-in-place polyurethane makes effective weather stripping and good garage door seal

FOR HEAT STABILITY*.....



it's

ESCAMBIA PVC

* **HEAT STABILITY** in Escambia PVC is improved to give you better control over color drift and other processing problems.

And this is only one of the advantages offered you by these products of Escambia's new plant — one of the most modern in the industry:

ESCAMBIA PVC 1250 — High molecular weight, recommended for extrusion of shapes and profiles and for calendered film.

ESCAMBIA PVC 1225 — Intermediate molecular weight, particularly adapted for supported and unsupported sheeting.

ESCAMBIA PVC 1200 — lowest molecular weight in this series, designed for flexible and rigid sheeting.

For additional information about Escambia's new resins, send us your inquiries on your company letterhead.

ESCAMBIA CHEMICAL CORPORATION

261 MADISON AVENUE • NEW YORK 16, N. Y.

Plasticizers & Stabilizers

STAFLEX KA

Phthalates

Adipates

Azelates

Sebacates

Ricinoleates

Technical Bulletins and Samples sent on request.

DEECY PRODUCTS CO.
PLASTICIZERS STABILIZERS
120 Potter St Cambridge 42 Mass

Cap and case for new precision electric razor are molded of cellulose acetate; decorative insert is molded of acrylic

Plastics in a new electric razor

With sales of men's electric shavers reaching an all-time high of 5 million units in 1956, the volume of plastics materials going into this lush and still fast-growing market is beginning to take on sizable proportions. Molded plastics cases are virtually standard equipment for those manufacturers already in the field. Even more important, the many new companies that within the past few months have made a bid to enter this highly competitive market, seem to be tying in a major share of their merchandising efforts with the design, styling, and production advantages to be obtained through the use of plastics.

One such company to come into the field wth a new type of electric shaver embodying a number of plastics components is Bulova Watch Co., Flushing, N. Y.

Mechanically, Bulova's new razor features such innovations as six high speed self-sharpening blades that are held under constant tension against the shearing plate and a special sideburn and mustache clipper. But, since sales of the new razor will be limited exclusively to retail jewelers, Bulova has incorporated an added plus in its product by providing it with a luxurious setting in the form of a handsome case molded of cellulose acetate. The cases will be made available in ivory trimmed with gold or charcoal trimmed with gold.

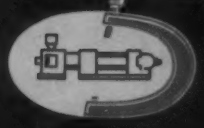
To take even fuller advantage of the sales potential inherent in the concept of the razor as an exclusive jewelers' item, Bulova has gone a step further from the decorative standpoint and used a molded acrylic decorative insert on the face of the razor. The rectangular insert which carries the Bulova name and trademark crest is reverse-surface decorated to give an attractive three-dimensional appearance. It is set into a molded-in seat in the face of the acetate case and cemented securely in place.

Credits: Cap for the Bulova razor is molded by Auburn Button Works, Inc., Auburn, N. Y. Case is molded by Berglund-Swenson Co., Inc., Arlington, N. J. Acetate for cap and case supplied by Eastman Chemical Products, Inc. Insert molded and decorated by Kent Plastics Corp., Evansville, Ind. Razor designed by Lawrence H. Haase, Chicago, Ill.

give your plastic products the benefit of the

MAKRAY OK

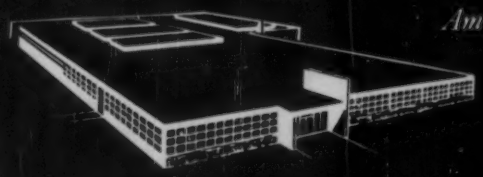
Precision Molding



The Makray "OK" on your product is the result of a unique system of engineering, designing, molding and assembly room techniques that result in the best in plastics technology. But, while we are unique in the quality of painstaking craftsmanship and inspection that we apply to your products, we are completely competitive in price. Whether we originate the design or work from yours our objective is the same: To give you a plastic product that looks better, works better and sells better.

When you are in or near Chicago come out and visit us. You'll see why results are finer from America's finest injection molding plant. Or, call or write today for the complete story on the Makray "OK"

Precision-molded microphone for the new Comptometer Dictation Machine.



America's finest, most modern plastic molding plant

- 24-hour operation assures speedy delivery
- 26 latest Hi-speed presses . . . 8 oz. to 60 oz. capacity
- Precision molds designed and built in our own shop
- Complete engineering service to serve you . . . save you money

MAKRAY MANUFACTURING COMPANY

Precision Plastic Molders

4400 North Harlem Ave., Chicago 31, Ill. • GLadstone 6-7100

North American FJ-4 Fury. Swept-wing jet fighter produced by North American Aviation, Columbus, Ohio, Division for the U. S. Navy.

SEIBERLING

SEILON S-3

Took the "Bugs" out of the Navy's FJ-4 Jet Air Scoop Cover!

The purpose of the air scoop cover is to keep insects, dirt, dust and debris out of the air intake while the plane is on field-line operation. *Before* SEILON S-3 was used, cover handles broke off and the covers became cracked and broken in handling.

Westerville Industries, Westerville, Ohio, began making the covers out of SEILON S-3—and there were no more "bugs". A single forming operation shaped the covers with integral handles that stay on, and the toughness and high impact strength of SEILON S-3 ended cover-cracking problems. SEILON S-3 also has a high heat distortion temperature, is resistant to chemicals, oils and many solvents. Available in calendered rolls and sheets, press-laminated sheets, and extruded sheets.

There are many types of SEILON. One may be the material with the exact properties you are looking for. We will welcome the opportunity to consult with you. Please write or phone us.

Plastics Division

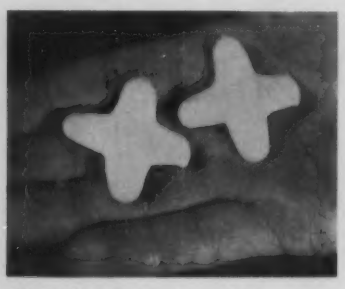
SEIBERLING RUBBER COMPANY

NEWCOMERSTOWN, OHIO • PHONE 8-8304

Polyethylene floats

A reduction of as much as 75% in the evaporation that usually takes place when volatile liquids are stored in open tanks has been reported in laboratory experiments with miniature foamed polyethylene floats. Because of the foam construction, the tiny air cells in the floats give added buoyancy and lighter weight.

Based on a specially modified expandable polyethylene, the floats are molded in star shapes that interlock and cluster together to provide maximum coverage of the volatile liquid's surface. In addition to cutting down evaporation losses, the floats also help smother noxious fumes emanating from the liquid, and eliminate frequent tank cover handling during processing. The floats, known as Mini-Vaps, are non-contaminating, chemically inert, puncture-proof, and non-breakable. According to the manufacturer, the Mini-Vaps cannot hang up on equipment or escape through drains or filters.



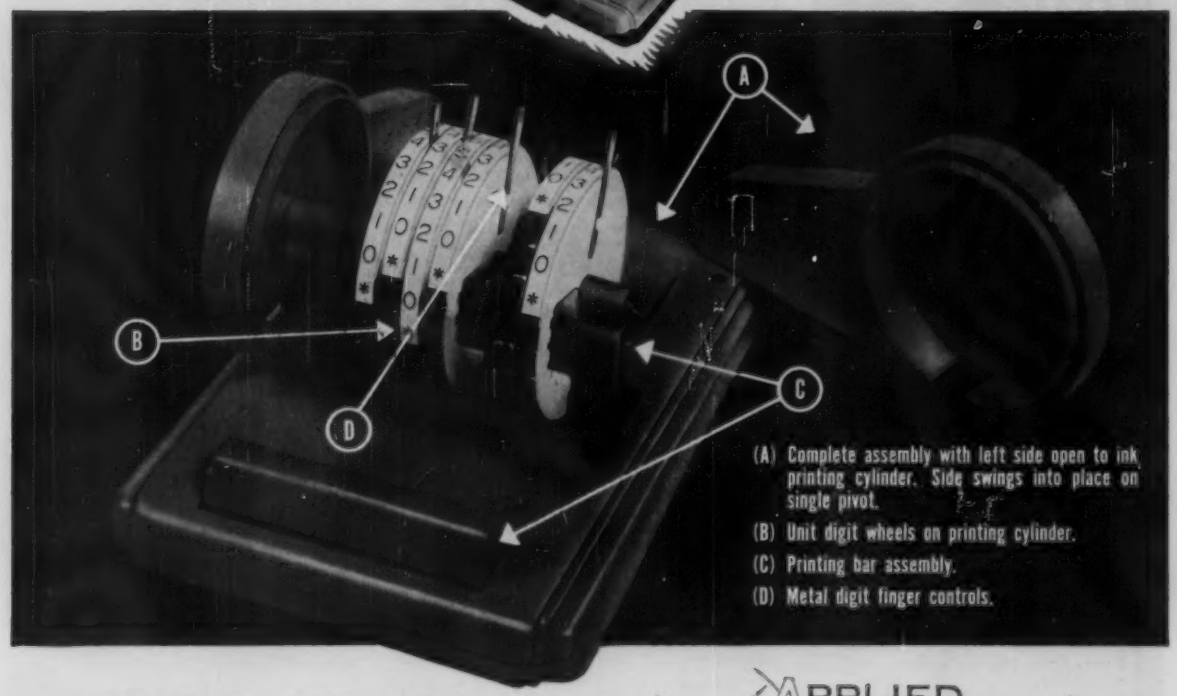
Star-like shape in which expandable polyethylene floats are molded permits them to interlock for maximum surface coverage

Bulk density of the floats is 17 lb./cu. ft.; nominal dimensions are ¼-in. thick by 1½-in. maximum width.

Suggested applications are in tanks used for plating, fermentation, cleaning, pickling, aging, rinsing, solvent and oil storage, anode treatment, and textile dyes and solutions.

Credit: Mini-Vaps are molded of Agilene F special modified polyethylene by American Agile Corp., Bedford, Ohio.

NEW PERMA PRINT CHECK PROTECTOR Low Cost Check Protector


A
B
C
D
(A) Complete assembly with left side open to ink printing cylinder. Side swings into place on single pivot.
(B) Unit digit wheels on printing cylinder.
(C) Printing bar assembly.
(D) Metal digit finger controls.

Molded in Styrene *for* APPLIED RESEARCH CORPORATION

The new "Perma Print" Check Protector, marketed by The Applied Research Corporation, prints thousands of checks without re-inking. The result is completely professional and impressive in every way

This handy check writer had to be inexpensive, lightweight, sturdy and absolutely reliable. Its cost must be low to give small retailers, professional men and even householders check protection. Quinn-Berry engineers were chosen for this job.

Here you see illustrated the many molded styrene parts and their function in the complete assembly. Precision engineering backed up by dimensionally stable thermo-plastic molding proved to be the desired answer.

Again a Quinn-Berry achievement in an unusual molded plastic application . . . proving, of course, that at Quinn-Berry the "Unusual is Routine."

DETROIT 27, Mich.
Harry R. Brethen
14231 Puritan Avenue
Broadway 3-8964

WYNNEWOOD, Pa.
Austin L. Wright
P. O. Box 12
50 East Wynnewood Road
Midway 2-5113

MILWAUKEE 13, Wis.
John Weiland, Jr.
7105 Grand Parkway
Greenfield 6-7161

EAST ROCHESTER, N. Y.
Dynatherm, Inc.
607 West Commercial Street
Phone: Hillside 5-0626

DAYTON 9, Ohio
G. Ross Vines
637 Monteray Avenue
Adams 8161

CHELSEA 50, Mass
Joseph Leader
68 Marlborough Street
Chelsea 3-3484

CHICAGO, Illinois
R H Frish
Room 211
6349 Northwestern Ave.
Ambassador 2-6005

KNOXVILLE, TENNESSEE
Harold Melloy
7028 Rockingham Drive
Phone 8-5155

WE FLY TO SERVE YOU FASTER!

QUINN-BERRY CORP.

2609 WEST 12TH STREET, ERIE, PA.

ALSO MOLDERS OF ALL TYPES OF THERMOPLASTICS

SENTINEL*
PACEMAKER

The Sentinel Pacemaker, made by pioneers in heat sealing, is a thermal impulse sealing method, designed and engineered to give you these advantages:

- Light Weight, compactness, low cost
- Requires no skill
- Insures a safe, FAST and positive seal with ease
- Precision automatic controls for correct pressure, heat dwell time and COOLING dwell time
- Seals varied thicknesses of Polyethelene, Saran, Pliofilm, MYLAR, Acetate and Vinyl, etc
- No fussy installation. Just plug in and start sealing
- Economical — draws current only during seconds when heating element is energized
- Simple, rugged, no service troubles
- Will soon pay for itself in faster production, improved seals

Sizes: 9, 13, 25 and 45 inches sealing area. Hand or foot operated.

For heavy-duty, large dimension jobs, the Sentinel High Speed Band Rotary Sealer — (Continuous Motion) and the Sentinel Jaw Type Sealer. Sentinel equipment meets U. S. Military Specifications.

Write for detailed literature

PACKAGING INDUSTRIES
151 Pine Street Montclair, N. J.

*Trademark

Please rush me detailed literature on MPL
☐ Pacemaker Sealer ☐ Jaw Type
☐ High Speed Band Rotary
Name
Company name
Address
City State

Plastics in disposables

(From pp. 93-99)

factured in a variety of sizes to fit all threads and openings.

Disposable polyethylene cartridges and nozzles are used by Pyles Industries, Inc., Detroit, Mich., for a new sealant gun (photo p. 99) designed to speed calking operations in aircraft and other assembly work. The cartridges, containing calking compound, fit into the gun barrel. Threaded nozzles, available in a variety of shapes and sizes, screw into the front end of the cartridges. When the trigger is pressed, air pressure extrudes the sealant. When the sealant is exhausted, the low-cost molded polyethylene parts may be discarded to eliminate cleaning time and costs.

Medical applications

In the medical field, disposable plastics really register. Disposable injectables, intravenous administration sets of various kinds, and many other types of expendable plastics items save time, money, and highly trained manpower in hospitals and medical laboratories.

An excellent case in point is a newly designed set (photo p. 99) for the collection of whole blood, and intended for disposal after use, developed by the Sterilon Corp., Buffalo, N. Y. With parts molded from Koppers' Dylene styrene, the set is being merchandised to hospitals and medical supply houses as the RC-17 Hemotrol blood donor set. A unique feature is the Rolla-Valve flow regulator, which can be adjusted by a simple thumb movement to regulate the flow according to the rate of vacuum. Following molding of the parts by DuBoxis Plastic Products Co., Buffalo, N. Y., each set is additionally fabricated, sterilized, and laboratory tested. Priced to hospitals at 36¢ each, the sets are packaged in boxes which contain 20 sets each.

A disposable enema set, fabricated from vinyl film and tubing by Pharmaseal Laboratories, Glendale, Calif., contains 4-oz. of a safe, fast acting enema solution —just enough for one patient's use. The attendant administers the enema directly from the tube, then throws away the empty tube. It is estimated that this disposable unit saves from 75 to 90% of the time spent by personnel in preparing and administering enemas in the conventional way.

The distributors of this device, American Hospital Supply Corp., Evanston, Ill., is concentrating on plastics disposables for the hospital field. Included are cups for laboratory specimens, disposable trays formed from vinyl and styrene sheet, polyethylene funnels, disposable sterile dishes, and many more items of this nature for various medical uses.

In the medical field, many items now made of glass or even metal which are used repeatedly and must be sterilized before each use, might logically be replaced by pre-sterilized, pre-packaged expendable products made from plastics materials.

The over-all picture

What of the whole general market aspect of plastics disposables? Market analysts have developed some opinions which are exceedingly interesting.

First, the trend toward casual living and increased leisure seems bound to increase the market for molded and formed disposable items. Second, the use of film as a disposable material confronts the industry with a serious distribution problem. Consumers don't buy paper per se: they buy writing paper or shelf paper or wrapping paper or paper towels, but in many cases the same type of film will be used for insulation and concrete curing, in disposable storm windows, as painters' drop cloths, or as furniture protectors. It is therefore likely that polyethylene film, at least, will be sold as yard goods at the consumer level. Third, the related fields of automatic merchandising and packaging are due for a great increase in the use of plastics materials in disposable containers and wrappings.

Perhaps only a small share of plastics' future is in the garbage can and incinerator—but from all present indices it should be a share which is an exceedingly profitable one.—END

Why Kodapak Sheet for window signs . . .

Signs printed on Kodapak Sheet by Goodran Products, Englewood, N. J.

The inside-outside story

WINDOW SIGNS printed in brilliant color on durable, clear-as-glass Kodapak Sheet are easy to see through—from inside or outside.

This means retailers can display them without hiding merchandise, without blocking the vistas of today's "open front" stores.

Little wonder retailers like them . . . use them . . . keep them doing their selling job.

Little wonder advertisers like them because *they do get used.*

And little wonder good sign-makers turn to Kodapak Sheet for this purpose. For Kodapak—uniform, stable, free from defects—provides an ideal surface for printing, keeps production costs at a minimum.

If you're interested in window signs or any of the hundreds of other uses for Kodapak Sheet, call our representative, or write.

Kodapak Sheet

"Kodapak" . . . trademark for Eastman's plastic sheet

MAKES GOOD MERCHANDISE SELL BETTER

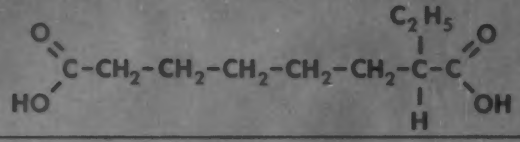
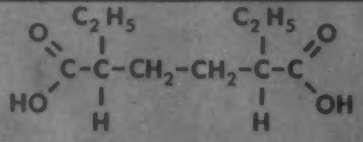
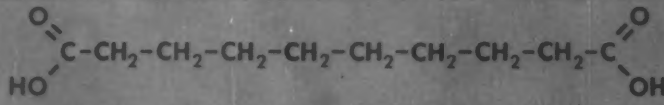
Cellulose Products Division, EASTMAN KODAK COMPANY, Rochester 4, N. Y.

Sales Offices: New York, Chicago, Atlanta. Sales Representatives: Cleveland, Philadelphia, Providence.
Distributors: San Francisco, Los Angeles, Portland, Seattle (Wilson & Geo. Meyer & Co.); Toronto, Montreal (Paper Sales, Ltd.).

U.S.I. ISOSEBACIC® ACID

a new intermediate for vinyl plasticizers, polyurethanes, polyamides, polyesters, alkyds

a mixture of SEBACIC ACID ISOMERS

2- **ethyl suberic acid**		72 to 80%
2,5- **diethyl adipic acid**		12 to 18%
sebacic acid		6 to 10%

U.S.I. ISOSEBACIC Acid lowers costs and improves performance when used as an intermediate for:

(1) vinyl plasticizers — gives excellent low-volatility, non-migration and low-temperature characteristics.

(2) polyurethane foams, (flexible and rigid).

(3) polyamide (nylon type) molding and extrusion plastics.

(4) polyester resins used in glass-reinforced plastics—gives improved flexibility.

(5) alkyd resins — imparts flexibility and water resistance to surface-coating film.

U.S.I. ISOSEBACIC Acid is a mixture of C_{10} dibasic acids which is now offered in pilot plant quantities at a development price of 45¢ a pound. Full-scale production prices will be even lower.

This new intermediate is a white crystalline solid with the following physical and chemical properties:

PHYSICAL PROPERTIES

Molecular weight	202.24
Combining weight	101.12
Density (80°C)	1.025 g/ml 8.55#/gal
Melt viscosity (80°C)	78.5 centipoises
Specific heat of vapor (226°C)	0.34 cal/g (est.)
Heat of vaporization (226°C)	107 cal/g
Specific heat of solid (24°C)	0.33 cal/g
Heat of combination	1296 K cal/mole
Flash point (closed cup)	430°F
Ionization constant at 25°C	$K_1 = 3.5 \times 10^{-5}$ $K_2 = 5.1 \times 10^{-6}$

CHEMICAL PROPERTIES

1. Undergoes typical reactions of the dibasic acids.
2. Reacts with alcohols to yield both acid and neutral esters.
3. Reacts with basic materials to give acid and neutral salts.
4. Relatively stable material, not oxidized by air at ordinary temperatures.

Send for samples and a U.S.I. technical data sheet. Ask a U.S.I. technical representative to call.

CHEMICAL PROGRESS WEEK-APRIL 8-12

U.S.I. INDUSTRIAL CHEMICALS CO.

99 Park Avenue, New York 16, N. Y.
Branches in principal cities
Division of National Distillers Products Corp.

4 new car parts

(*From pp.* 106-108)

it is possible economically to use the same basic hood stamping dies for both the Golden Hawk and the Silver Hawk, a model which is not supercharged and therefore does not require the additional headspace for the engine compartment.

Metal mounting brackets cemented to the underside of the hood overlay are used to fasten the overlay to the metal hood. The overlay panel, which is also produced by Reinforced Plastics Div., General Tire & Rubber Co., weighs 5.2 lb., and is match metal molded from a preform on a 150-ton press having a 54- by 36-in. platen area.

Reinforced plastics grilles for use on trucks

For the truck field, General Tire is turning out reinforced plastics grilles. Studebaker-Packard is using one such grille on its line of Transtar trucks, ranging from ½-ton pickups to 2-ton heavy-duty units. The grille weighs 12.5 lb. and extends across the entire front of the truck—a design feature which is claimed to permit more efficient engine cooling. It has three vertical struts and integral frames for the headlights and is molded from a preform on a 300-ton press with a 54- by 80-in. platen area. After molding, metal mounting brackets are riveted to the back of the grille and metal units for headlight mounting are then permanently cemented in place.

Somewhat different in design is the reinforced plastics grille used by International Harvester for its new V-line cab-over-engine trucks. Essentially rectangular in shape, the unit incorporates a vertical center strut and a horizontal strut extending the full width of the part. It weighs 4.5 lb. and is made from resin-impregnated fibrous glass mat on a 100-ton press with a 61- by 51-in. platen area. A grey enamel is applied to the part after molding, but custom colors in a variety of hues and shades—to meet company identification requirements, for example—are also available on request.—END

ENTOLETER® NEWS

ENTOLETER DIVISION • Safety Industries, Inc. New Haven 4, Connecticut

Vol. 1, No. 1 April 1957

"Entoleter" New CentriMil SERIES 40 NOW AVAILABLE TO THE PLASTICS INDUSTRY

The Entoleter Division announces the "Entoleter" CentriMil Series 40 for applications requiring extreme impact velocity (35,000 feet per minute) or enormous capacity (up to 250,000 pounds per hour) . . . such as . . .

. . . heat sensitive materials (thermo-setting plastics, sugar)

. . . crystalline solids or friable materials (salts, magnesium oxide)

. . . particle size reduction with minimum range of sizes.

. . . materials to be reduced in size along natural cleavage lines (asbestos, cork)

. . . the particle size reduction of mixtures in which only one material must be reduced, so that it may be separated from the mixture (starch from fiber, handbark from cork)

One of the specially designed liners for the "ENTOLETER" CentriMil Series 40, being examined in the Entoleter laboratory.

The "Entoleter" CentriMil Series 40 features...

A ROTOR...
which weighs over 500 pounds, dynamically balanced by electronic devices, with 40 specially designed impactors which travel at speeds of over 7 miles per minute.

MOTOR...
available up to 125 hp in constant speed design or 60 hp variable speed, providing capacities to meet the needs of the largest plastics plant.

ENTOLETER DIVISION
SAFETY INDUSTRIES, INC.
P.O. Box 904 New Haven 4 Conn.

WEAR and CORROSION RESISTANT PARTS...

for special applications . . . stainless steel construction and impact surfaces of special wear resistant materials are provided.

LUBRICANT...

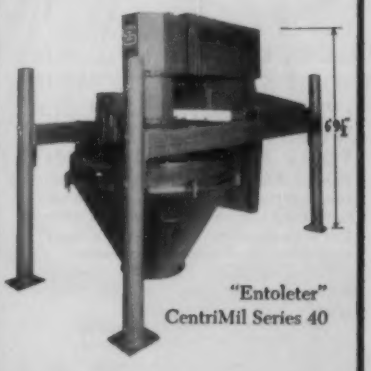
of the latest oil mist type for the main bearing to insure proper lubrication for continuous service.

The design and development of the "Entoleter" CentriMil Series 40 adds one more chapter to the "Entoleter" story . . . culminates 17 years of product development which has kept pace with the demands of the expanding chemical industries...

the "Entoleter" Standard 14" Impact Mill for blending and intimate dispersion, capacity to 8 tons per hour.

the "Entoleter" 27" Impact Mill increased velocity for more intimate dispersion and particle size reduction, capacity 30 tons per hour.

the "Entoleter" Aspirator . . . for separation by air, of mixtures consisting of materials of varying density or air foil.



"Entoleter" CentriMil Series 40

HOW WE CAN HELP YOU...

The Entoleter Laboratory is continually developing new applications . . . contact us . . . send your specifications and a sample of your product for processing (free of charge).

REDUCE YOUR OPERATING EXPENSES WITH EXPERIENCED

Plandex Plastics Reworking Service

STRAINING, CLEANING AND PELLETIZING

Polyethylene Film!

Recompounding with Additives TO IMPROVE FLOW CHARACTERISTICS OF PLASTICS SCRAP

VIRGIN MATERIALS

Compounded To Your Recipes

LABORATORY QUALITY CONTROL WITH TESTS EVERY 30 MINUTES

• PLANDEX METHODS REDUCE WEIGHT LOSS AND IMPROVE YOUR PROFIT POSITION!

Plandex does not own a single ounce of scrap plastics, concentrating on streamlined reclaiming service alone. Our production line is equipped with Welding Engineers' customized dual worm compounder-extruders and with "know-how" that assures accurate interpretation of your specific requirements.

Write for literature or sales engineering appointment.

PLANDEX CORPORATION
DOWNINGTOWN, PA.
PHONE ANDREWS 9-2130

See-through

(*From pp. 104-105*)

metal screen which is held in position below the heating element and the fan.

Helene Curtis engineers point out that had this inner hood portion been made of metal, it would have been a more complicated and costly part. If fabricated of metal stampings, for example, the unit would have involved extensive assembly and welding operations. With the plastic part, grille openings, vanes, and other features required are produced in a single molding operation, and very little additional work is required.

Third of the transparent acrylic parts is the combination emblem and control plate, which is molded with the Helene Curtis name and the various temperature graduations debossed into the back surface of the piece. This component is vacuum metallized and painted. Three studs molded on the back provide attachment to the metal housing by means of Tinnerman fasteners. This part, which has a concave back fitting the contour of the motor and fan housing, is molded on an 8-oz. injection machine.

Styrene replaces magnesium

From the functional and design standpoint, one of the most interesting plastic parts in the new hair dryer is the molded styrene fan, which replaces a cast magnesium fan used on earlier models. This nine-bladed unit, according to Helene Curtis spokesmen, not only proved less costly to produce than the metal fans, but also provides smoother, quieter operation.

The weight of the plastic fan, molded of high-heat-resistant styrene, is 10 oz., as compared to 13 oz. for its metal counterpart. With the 13-blade metal fan, it was necessary to cut three radial slots in order to reduce the resonance of the unit as it rotated; because of the inherent sound-deadening characteristics of the plastic, no such operation is required on the styrene fan. Furthermore, the magnesium fan required a two-stage dynamic balancing operation which involved drilling holes in the part and inserting lead and steel rivets. This operation involved considerable time and labor. When the plastic fans are delivered by the molder, they are already more perfectly balanced than the metal fans after the first stage of the balancing process. Final balancing merely involves removal of excess material by means of a belt sander, at locations indicated by the dynamic balancing equipment. The over-all cost of the plastic fan is about half that of the metal fan.

Molded of translucent white styrene, the new fans are produced in a single cavity mold on a 20-oz. injection machine. The three openings in the rib-reinforced center boss of the fan, including the shaft opening and two holes for fastening screws, are cored in the mold. Following the molding operation, the fans are sprayed with gold colored lacquer to reduce electrostatic properties and prevent the fan from attracting dust and hair when in use.

When the switch to plastics was being considered there was some question regarding the use of styrene in the dryer fan because of the heat problem. The fan is mounted directly above the ring-type sealed electrical heater and maximum operating temperatures at this point sometimes run as high as 140° F. However, fans molded of the heat-resistant styrene material, in test runs as well as in the operation of some 20,000 dryers under actual service conditions, have proved their ability to meet these conditions without difficulty.

The extensive use of molded plastic parts in this new hair dryer, with resulting production economies, superior operating characteristics, and improved appearance, again emphasizes the growing trend to plastics for more and more appliances and other soundly engineered products which must stand on their merits in today's competitive market.

Credits: Molded acrylic parts produced by G. Felsenthal & Sons, Inc., Chicago, Ill., using Lucite and Plexiglas. Fan molded by Plastics Div., General American Transportation Corp., Chicago, using Koppers high-heat-resistant styrene. Nylon column guides supplied by Central Molded Products Co., Chicago.

research and development

of test tube ingredients

TODAY...

new PROFITABLE product

TOMORROW

If you need to upgrade existing products... or synthesize new ones... to diversify and strengthen your position and to broaden your markets and increase your sales... Resin Research Laboratories can help you. As specialists in resins and polymers, their related raw materials and multiple applications, we're fully staffed with fine technical talent... well equipped with the most modern laboratory facilities to do each job quickly, efficiently and economically.

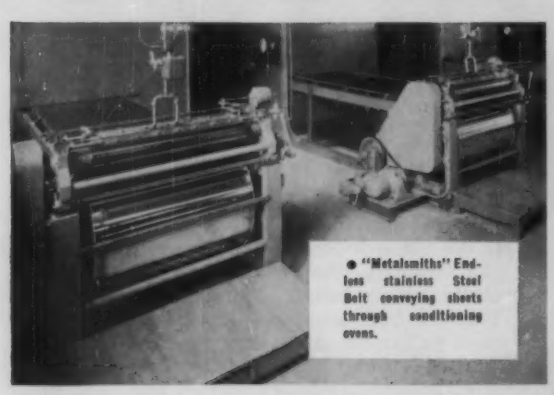
Let us tell you more...
there's no obligation for consultation.

Tomorrow's Products...
Through Resin and Polymer Research Today!

RESIN RESEARCH LABORATORIES, INC.
406 Adams Street, Newark 5, N. J.

ENDLESS STAINLESS STEEL BELTS

Speed up Cooling — Setting — Conditioning of Sheets—film—coatings—laminated work



● "Metalsmiths" Endless stainless Steel Belt conveying sheets through conditioning ovens.

Automatic Contact Glass

Polished stainless steel belt provides high gloss as materials move through cooling and conditioning.

Investigate continuous belt-processing for increased production and lower costs. One-piece, polished or unpolished, in any length and extra-wide sizes. Stainless steel (18-8) provides dense, corrosion-free surface. Width and camber controlled. Consult our engineers. Metalsmiths, 558 White St., Orange, N. J.

METALSMITHS STAINLESS STEEL ENDLESS CONVEYOR BELTS

FIORE

MASKS FOR PRECISION PAINTING

Fiore Spray Masks are used on plastics, stampings and die-castings that have depressed or raised detail and on any other irregular shaped surface. If a product can be molded, stamped or die-cast, it can be decorated by Fiore spray masks.

Over ten years many manufacturers have been decorating their products by using Fiore spray-masks, associated jigs, fixtures and spray machines. Fiore Spray Masks and accessories are simple to use. An unskilled worker can operate them without special training and obtain perfect duplication and greater speed at a minimum cost.

FREE

—send for your copy of this helpful new manual.

WM. M. FIORE INC.

269 41st ST., BROOKLYN 32, N. Y.
STerling 8-3444

These Machines Give You

A BIG ADVANTAGE

In Making Fine Molds and Hobs

CONTOUR MASTER

Tool and Die Miller

Accurate mold contours, requiring very little hand finishing, are produced quickly on the CINCINNATI® Contourmaster. These fine milling machines smoothly and automatically guide the cutter over the same vertical profile as followed by the tracing finger. Shaping attachment, twin rotary tables, and 18 other types of extra equipment available. Write for catalog No. M-1919-1.

MONOSET

Cutter and Tool Grinder

Cutters for milling die and mold contours are sharpened in **one chucking** on CINCINNATI® Monoset Cutter and Tool Grinders. And you can make small intricate cutters . . . grind them complete from solid bar stock . . . when you need one in a hurry. The Monoset has many desirable features for sharpening ordinary cutters, too. Get the complete story in catalog No. M-1591-3.

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • HEAT TREATING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

CINCINNATI

THE CINCINNATI MILLING MACHINE CO. • CINCINNATI 9, OHIO

Newest cargo carrier

(*From pp.* 110-112)

a new locking device, developed by Clark Equipment Co. which secures the cargo units to the car, eliminating the conventional tie-down operations.

The fact that the Convert-A-Frate carriers are conveniently loaded from the side eliminates the customary procedure of driving piggy back trailers onto flatcars from a ramp at the end of the car. The cost of the equipment involved in the Convert-A-Frate system is about half that of conventional flatcars and highway trailers. The reinforced plastic unit, it is stated, can be produced in volume at reasonable cost.

Through use of the new Convert-A-Frate service, industries heretofore not accessible to railroad rights-of-way can take advantage of economical rail freight hauling. It also means that shippers will no longer have to worry about the availability of specialized freight cars, because the new system "tailors" the cargo unit to suit the shipper's requirements. Even further economies may be realized when volume becomes sufficiently large to justify operating regularly dispatched trains made up entirely of Convert-A-Frate flat cars. Cargo units will be taken on or off such trains at convenient traffic points served by flat-bed highway trucks.

With the railroads working aggressively to meet the competition of other shippers, and seeking better methods of reducing dead weight, cutting maintenance costs on rolling stock, and providing improved service for their customers, Rock Island's new Convert-A-Frate refrigerator car may open up a huge new market for reinforced plastics in the transportation field. In any event, rail executives cannot afford to overlook the obvious plus features made possible in the refrigerator unit through this material.

Credit: Scotchply epoxy-impregnated reinforced plastic laminate and finished sandwich panels incorporating Scotchply skins and structural members by Minnesota Mining and Manufacturing Co., St. Paul, Minn.

*The Finishing Touch**

Engineered and Produced by
Detroit MACOID

* MACOID produces a variety of anti-squeak trim moldings for automobile interiors which were designed and engineered in cooperation with leading automobile manufacturers.

Producing intricate injection molded trim for automobile interiors is only one of MACOID'S many specialties.

Whatever the product—if it can be made of thermoplastics there's a team of MACOID specialists ready to step in and do the job quickly, efficiently at *any* stage of development!

If you'd like, MACOID stylists can translate your rough sketch into a practical, finished design. Or MACOID'S engineering staff can convert your product specifications into working drawings.

And—MACOID is equipped to maintain *quality standards* at the lowest possible per-unit cost. MACOID'S extrusion and injection molding facilities are among the most efficient in the industry.

For a way to do it better with plastics—consult Detroit MACOID.

DETROIT MACOID CORPORATION

12340 CLOVERDALE, DETROIT 4, MICHIGAN

EXTRUSION AND INJECTION MOLDING

Originators of Dry Process Plastics Extrusion

Which plastics

(*From pp.* 113-116)

The Howell Automatic Machine Co., Cleveland, Ohio, and Eiler Equipment Co., Minneapolis, Minn., are among such suppliers.

Metal plus plastic

A unique combination of metal and plastic is used in the self-locking Unbrako socket screws having the patented Nylok locking feature, produced by Unbrako Socket Screw Div., Standard Pressed Steel Co., Jenkintown, Pa. In these screws (photos p. 114), available in a variety of sizes and types, a nylon pellet is inserted in the threaded portion of the metal screw, eliminating the need for lock-washers, adhesives, and wired heads. When the bolt is installed in a tapped hole or a standard nut, the exposed portion of the nylon pellet is compressed between the mating threads. In an attempt to regain its original shape, the nylon insert forces the threads together under pressure, increasing the friction between the metal surfaces and resisting the tendency of the bolt to loosen in service. On properly seated screws, the plastic pellet acts as a liquid seal; whether seated or not, the screw locks positively wherever wrenching stops.

An automatic machine operation is used by Standard Pressed Steel Co. in producing the self-locking Unbrako socket screws. Extruded coil stock having a loaf shaped cross section is purchased by SPS from Nylok Corp., Elmira, N. Y. Before final cutting and inserting of the nylon pellets, SPS reprocesses the extruded stock so that dimensions fall within the exacting tolerances required. A multiple spindle Kingsbury automatic drilling and tapping machine positions the metal screw, drills a hole part-way through the threaded portion, punches a pellet from the coil stock, and inserts the nylon pellets under a force fit.

Also depending upon nylon for its successful application is the Grippit fastener (photo p. 116), produced by Tru-Lock Fasteners, Inc., Woodbury, Conn. This device is an elongated and unthreaded nylon nut which snaps into a hole in one of two surfaces being joined. Its self-retaining feature permits insertion during production runs without dislodgement during handling. A self-tapping screw impresses its own threads on the inner wall of the lower portion of the nut. As the screw is tightened, the counterbored section of the device is drawn upward and squeezed outward, forming a rigid collar and locking the two surfaces together.

Plastikhold expansion anchors, molded of Tenite butyrate by American Plastics Corp., Bainbridge, N. Y., are used to hold screws (photo p. 114) in plasterboard, brick, wood, tile, and other materials. Driven into ¼-in. drilled holes, they expand or mushroom as wood screws are inserted and tightened; gripper fins prevent them from turning in the hole. A different type of expansion is involved in the Scru-Tite anchors, extruded of Tenite butyrate by Mastercraft Plastics Co., Inc., Jamaica, N. Y. These

Radiant Heaters

For your difficult baking and drying jobs.

The most efficient radiant heater you can buy.

- BEST FOR PAINT BAKING
- BEST FOR PLASTIC FORMING
- BEST FOR FOUNDRY CORES
- BEST FOR TEXTILE DRYING
- BEST FOR PAPER DRYING

If you need a Clepco Radiant Heater you are paying for it every day.

SEND FOR COMPLETE INFORMATION

THE CLEVELAND PROCESS COMPANY

1965 EAST 57TH STREET • CLEVELAND 3, OHIO

NOW—POLYURETHANE FOAMS

AT LOW PRODUCTION COSTS

KLAUDER WILLIAMS

FOAM MACHINE MODEL 800

ALSO AVAILABLE with traverse mechanism and synchronized belt conveyor. A product of Klauder Weldon Giles Machine Co.

At last you can produce your own polyurethane foams in quantity at unbelievably low cost. The Klauder Williams foam machine offers adaptability for a full range of formulations. Either rigid or flexible foams can be made by simple adjustments.

Klauder Williams machines blend successfully all formulations manufactured to date by continuous proportionate metering and mixing. Volume and specialty production has now become a practical reality at an amazingly low investment.

Write today for our new brochure describing the advantages of these new foams and details of the machines and their attachments.

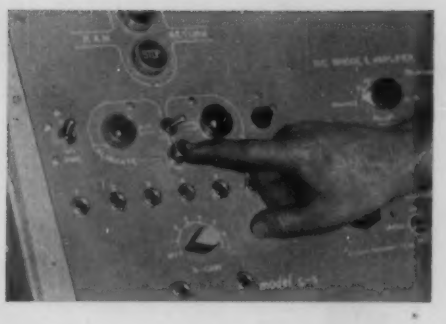
GABRIEL WILLIAMS CO., INC.

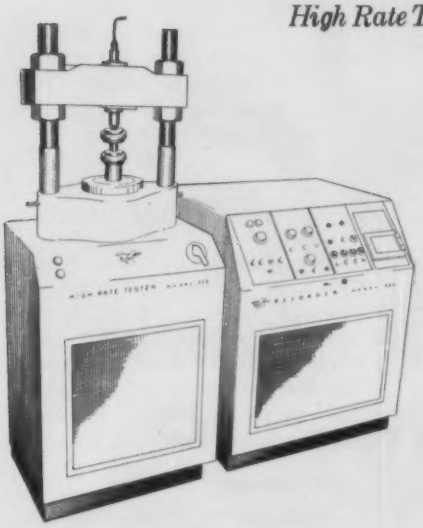
77 MILL ROAD • FREEPORT, LONG ISLAND, NEW YORK

TEL.: FR 8-1990

TENSILE AND COMPRESSIVE TESTING AT RATES AS HIGH AS *6000* INCHES PER MINUTE

with the ALINCO Model 625 High Rate Tester





WHEN YOU depress this button, the ALINCO Model 625 High Rate Tensile and Compressive Tester provides you with a single, accurate stress-strain record that will reveal deformation rate, ultimate yield, elastic modulus, effect of deformation rates on elastic modulus and tensile strength, etc., at HIGH or low rates. If you need comprehensive data on the mechanical properties of your materials, write today for detailed literature on this new tester.

ALLEGANY INSTRUMENT COMPANY, INC.
EASTERN DIVISION: 1091 WILLS MOUNTAIN CUMBERLAND, MARYLAND
WESTERN DIVISION: 1052 WEST 6TH STREET LOS ANGELES 17, CAL.

ALINCO

WILLIAMS-WHITE HYDRAULIC MOLDING PRESSES

for Better Products

A battery of SIX 113-Ton Hydraulic Presses with hydraulic pressure furnished by ONE pumping unit and ONE motor!

The hydraulic circuit is so designed that pressure is maintained in five presses while the sixth is opening or closing. Automatic cycle control of each press is by pushbutton and adjustable timer.

This system represents considerable reduction in initial and maintenance costs by eliminating the expensive, space-consuming accumulator while retaining its desirable features.

For full information, see our Representative or write us direct.

REPRESENTATIVES

ALLIED NORTHWEST MACH. TOOL CORP. Portland, Oregon
A. L. BECHTEL & SON Cleveland, Ohio
GEORGE A. DAVIES MACH'Y. CO. Los Angeles, California
SEIFREAT-ELSTAD MACH'Y CO. Cincinnati, Columbus or Dayton, Ohio
EDWARD A. LYNCH MACH'Y. CO. Wynnewood, Philadelphia, Pennsylvania
PAGEL MACH'Y. CO Milwaukee, Wisconsin
PERINE MACH'Y. & SUPPLY CO. Seattle, Washington
FRANK RYMAN'S SONS Pittsburgh, Pennsylvania
WILLIAMS-WHITE & CO. 53 W. Jackson Blvd., Chicago, Illinois
E. E. WOOD MACH'Y. CO. Detroit, Michigan

WILLIAMS-WHITE & Co.
300 EIGHTH ST. • MOLINE, ILLINOIS
PRESSES • BULLDOZERS • BENDERS • PUNCHES • SHEARS

BUILDERS OF MACHINERY SINCE 1854

The hose that shows

as it goes

This factual H & D display-pack promotes its product all the way home. Convenient hand-hole makes it a walking advertisement. Your product need a merchandising package? Better see H & D.

HINDE & DAUCH

Subsidiary of West Virginia Pulp and Paper Company

AUTHORITY ON PACKAGING • SANDUSKY, OHIO
14 FACTORIES • 42 SALES OFFICES

anchors (photo p. 116), having fluted surfaces, are first hammered into a drilled hole in brick, plaster or other solid materials. Then a nail or screw is driven into the fastener, causing the plastic to cold-flow into the grooves for a positive two-way grip.

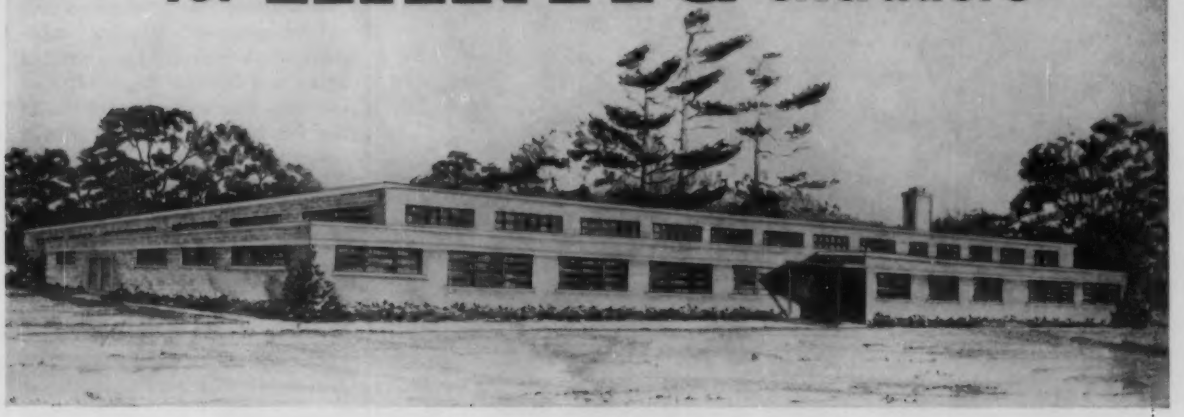
Headed push-in-type plastic fasteners used in attaching insulation material to the firewall of cars and trucks are among the many varieties of plastic assembly aids produced by Fastex Div., Illinois Tool Works, Des Plaines, Ill. These fasteners (photo p. 114), molded of polyethylene, are designed with a series of rings, tapered on the "down" side for easy entry but straight on the back surface so they will not pull out easily. In installing these fasteners, a simple hand tool is inserted in the hollow shank, stretching the plastic unit lengthwise for easier insertion. When the tool is withdrawn, the fastener returns to its original diameter for a moisture-tight fit.

Wall clamps

When electric wiring, conduits, etc., must be fastened to a firewall, a sheet metal housing, or a wall surface of any kind, the method of fastening should provide not only the required mechanical support, but also serve as an electrical insulator. Several forms of plastics clamps have been developed for this purpose. A one-piece molded nylon clamp being developed by Fastex for holding wires, cables, and tubes (photo p. 114), replaces a more costly aluminum clip which required covering with an insulating material and was frequently assembled with a screw and nut. The curved-base design and snap-in feature of the nylon clip provide a tight, rattle-free application; in addition, this fastener will accommodate a variety of wire and tube sizes, plus a range of panel thicknesses. Petal-like fingers molded on the base of this device compress when pushed through an opening, then flare open on the other side of the panel, locking the unit in place.

Reinforced plastics cable clamps (photo p. 115) were recently introduced on a national basis for the first time by Lunn Laminates,

The new manufacturing plant for HARTIG extruders



HARTIG EXTRUDERS

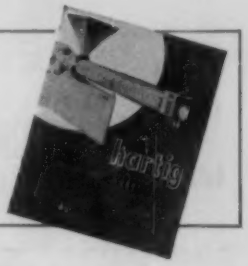
Designed for Today's Needs... and Tomorrow's

To meet growing demand,
the Hartig organization will move to this newly-built
and newly-equipped plant at Mountainside, New Jersey.
Established in 1890, Hartig has been able to proceed
with the new plant because of confidence
the plastics industry has placed in Hartig equipment.
The new manufacturing facilities will enable Hartig
to justify that confidence throughout the years to come.

HARTIG EXTRUDERS

ESTABLISHED 1890
448 HILLSIDE AVENUE, HILLSIDE, NEW JERSEY
Chicago Representative:
C. J. BERINGER, 727 ECHO LANE, GLENVIEW, ILLINOIS

Send for your copy of the new booklet describing the complete line of Hartig Extruders and auxiliary equipment.



HARSHAW

cadmium lithopone

YELLOWS and REDS

Available in Eleven Brilliant Shades

- YELLOW
- ORANGE
- RED
- MAROON

For colorful plastics in rich deep tones or delicate pastel tints, use Harshaw cadmium pigments. Their maximum chemical and heat resistance combined with complete insolubility make them excellent colorants for many types of plastics, such as: polystyrene, polyvinyl chloride, cellulose acetate, polyethylene, and methyl methacrylate.

it's yours

Send for color folder showing complete line of Harshaw Cadmium Lithopone Yellows and Reds.

Corresponding shades of concentrated C. P. Cadmium Pigments are also available.

THE HARSHAW CHEMICAL CO.

1945 EAST 97th ST., CLEVELAND 6, OHIO

clip and mail

Send me your Cadmium Lithopone Color Card.

My Name_____

Company Name_____

Street_____

City_____ Zone____ State_____

Inc., Huntington Station, N. Y. These clamps, available in a variety of sizes, are non-corrosive, strong, fire resistant, and provide excellent electrical insulation. Used originally in the aircraft industry, they are ideal for many applications where vibration and shock are encountered.

Weckesser also produces a line of wrap-around plastics cable clamps fabricated from extruded nylon and Ethocel ethyl cellulose sections. The smooth surfaces of the flexible plastic fastener will not cut or abrade insulated wiring; even if a metal screw or bolt is used to mount the clamp, complete insulation is afforded because the clamp wraps fully around the wire or group of wires.

Plastics rivets

The Plasti-Rivet, a product of Fastex, is a one-piece, self-expanding blind rivet ideally suited for a wide range of fastening assignments. Injection molded in multi-cavity dies, it may be made of a variety of thermoplastic materials, including nylon, acetate, butyrate, styrene, and polyethylene. The Plasti-Rivet (photo p. 116) is designed with a hollow shank having flaring prongs which may be compressed for insertion into a blind opening or through a hole in one or more pieces of metal, laminate, or other material to be fastened together. A blow on the integrally molded pin of the rivet shears the pin from its temporary anchorage and drives it through the hollow shank, wedging the prongs apart for a positive, tamperproof lock. Attachment of a component strip in a TV tuner is a typical application.

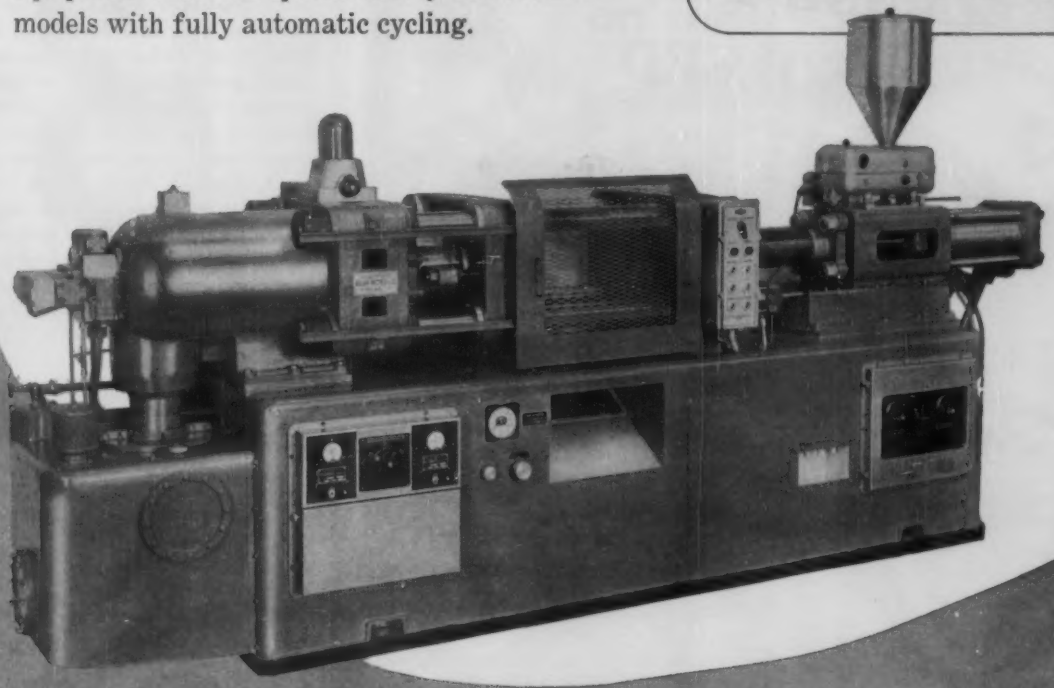
Through design adaptation, this basic rivet appears in other specialized types of fasteners—a Plasti-Grommet, for example (photo p. 115) which fastens metal assemblies together and provides an insulated one-piece self-retained blind nut, or a Plasti-Support (photo p. 116) for anchoring refrigerator shelves and other types of components. In the latter instance, the plastic rivet is engineered as an integral part of a specially designed supporting unit.

When Plasti-Grommets are used to fasten the handle of an

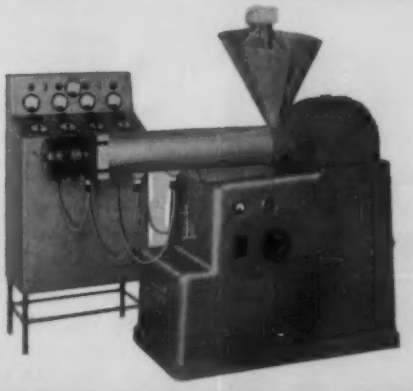
AUTOMATION

This is the age of automation and Negri Bossi automatic machines lead the way. Negri Bossi equipment features special safety devices and models with fully automatic cycling.

R. 12 F.A. Fully automatic injection press – capacity 4 to 6 oz. – fast operating cycles (8 shots a minute)



VUOTOPLAST Vacuum Forming Machines



EXTRUDERS and accessory equipment

Write for further information

Sole distributors:

U.S.A.—Acme Machinery & Manufacturing Co., Inc.
102 Grove Street, Worcester, Mass.
Phone: PLeasant 7-7747

New York Office: 2315 Broadway
Phone: SUsquehanna 7-1705

Canada—Plastics Equipment & Accessories
1362 Jean Talon Est.
Montreal 35, P.Q.
Phone: CRescent 4-8274

NB&C

NEGRI BOSSI & CO., MILANO (ITALY)

Corso Magenta, 44

Cable address: Gianimar

New Patapar®

Releasing Parchments

As a casting sheet for polyurethane foams, Patapar gives a smooth satin finish.

Patapar releases easily from pressure sensitive plastics.

As a separator for rubber tape, Patapar provides just the right release action.

peel off easily from pressure sensitive and tacky surfaces

Effective releasing action in almost any situation is provided by new types of PATAPAR RELEASING PARCHMENTS. Features of these Patapars include: dense, fiber-free texture – high resistance to penetration or migration of oil and softeners – permanent releasing action. They are totally inert to any surfaces they contact.

Patapar Releasing Parchments show excellent performance in many processes involving:

- Synthetic rubbers
- Polyurethane foams
- Polyesters
- Vinyls
- Organic adhesives
- Organosols
- Phenolics
- Acrylics

A brochure of testing samples and detailed information is available on request. If desired, we will give technical assistance and consultation on releasing problems. *Write us on your business letterhead.*

Patapar®
RELEASING
PARCHMENT

HEADQUARTERS FOR VEGETABLE PARCHMENT SINCE 1885

oven, broiler, or storage drawer to a stove or in similar applications, they replace the nut-bolt-spacer assembly often used. This permits assembly in the field and loose shipment of the handle, since inner access to the fastener is not required. Repairs are easier because the inner side of the door does not have to be removed to disassemble the handles. The same type fastener may also be used with a thread-cutting screw in the legs of a stove to hold the unit in the packing crate and to serve as a leveling screw when the appliance is set up. Here the plastic unit eliminates costly welding of a metal nut to the foot of the stove and can withstand a load of 500 to 600 pounds.

Plug units

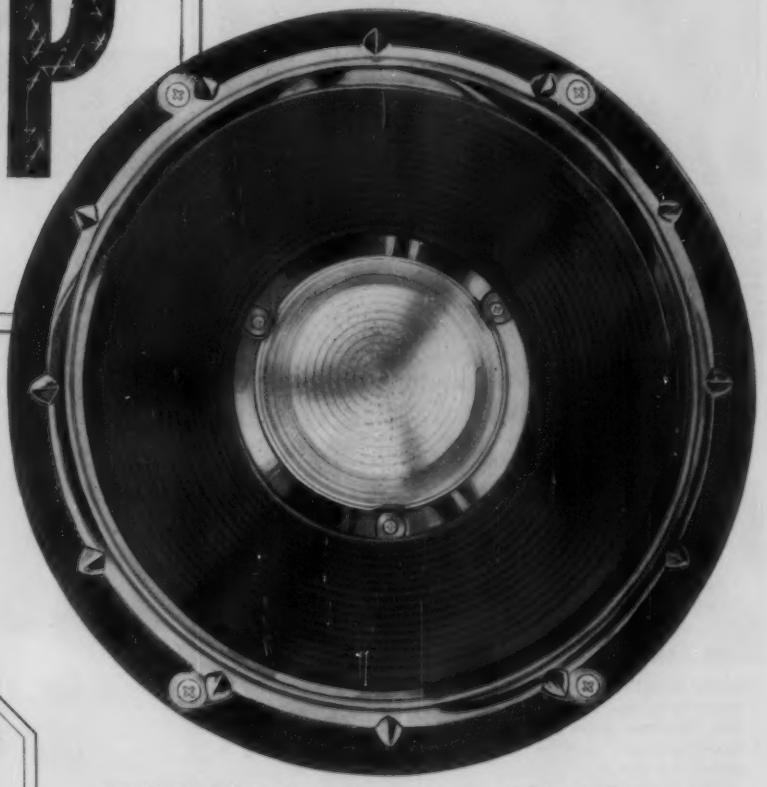
In various assembly and manufacturing operations, openings are left in sheet metal panels which must be concealed in the finished unit. One of the most inexpensive and satisfactory methods of handling this problem is to use a molded plastics plug or button having tapered prongs on the back surface. Fastex produces a line of such units under the name of Plasti-Plugs (photo p. 115), using both polyethylene and impact styrene. In use, the prongs are simply forced through the opening under finger pressure, springing open on the other side of the panel so that the button is held in place. They may be molded in any desired color to match end-use requirements, eliminating expensive rack painting. Some are produced with ventilation openings; others have a plain flat or domed surface. Such plugs make ideal, easily installed feet for bathroom scales, radios, and other appliances. Another variety of fastener being developed by the same manufacturer, is molded with a concave "dimple" on the base side (photo p. 115). When the base fastener is inserted in an opening and pushed by a blunt tool, the dimple snaps outward due to the flexibility of the molded nylon material, spreading six base segments and locking the integrally molded unit and fastener in place.

Among the other specialized types of plastics fasteners developed by Fastex are cable straps

ERIEFLEX® REFLECTOR LENSES SHOUT

STOP

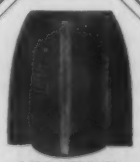
on the 1957 FORD



SOME OTHER TAILLIGHTS and BACK-UP LENSES PRODUCED BY

ERIE *plastics*

1957 MERCURY TAILLIGHT



1956 MERCURY ERIEFLEX TAILLIGHT

1956 FORD ERIEFLEX TAILLIGHT

ERIEFLEX Reflector Lenses have optical precision. They combine the superior brilliance of custom injection molded acrylic with special prismatic design. Their jewel-like sharpness reflects light over a greater distance and width of range.

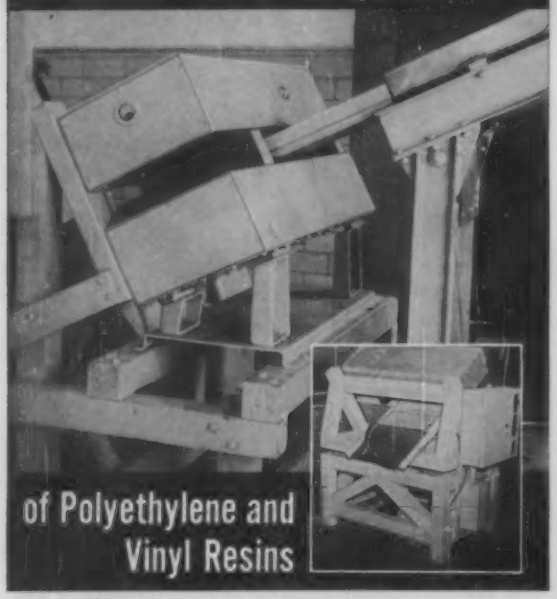
ERIEFLEX Reflector Lenses exceed S.A.E. and state automotive requirements.

ERIEFLEX Reflector Lenses have a superior color stability . . . deliver higher candle power . . . are practically unbreakable in shipment, handling, and assembly . . . have dimensional accuracy and flexibility for quick, easy assembly.

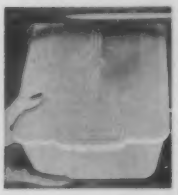
ERIE Sales Engineering Department is available to give you technical assistance in solving your reflector lens and taillight problems.

ERIE *plastics*

ERIE PLASTICS DIVISION
ERIE RESISTOR CORPORATION
Main Offices and Factories: **ERIE, PA.**
Manufacturing Subsidiaries:
HOLLY SPRINGS, MISSISSIPPI • LONDON, ENGLAND • TRENTON, ONTARIO



BAKELITE CO. USES RCA METAL DETECTOR TO SPOT UNWANTED METAL



The compounds in sheet form are passed through the Metal Detector prior to dicing and shipping to the customer. Should any tramp metal be discovered at this point, it can be removed, thus insuring the customer a pure uncontaminated product.

The RCA Metal Detector's positive automatic operation safeguards quality electronically. Wired to sound an alarm, spray-mark the metal area, or stop the conveyor when trouble threatens, the Detector protects your product and your reputation—prevents damage to costly machinery, acts as a check on the condition of other equipment. Because of the great savings that usually result from the use of RCA Metal Detectors, many plastics processors consider it essential equipment.

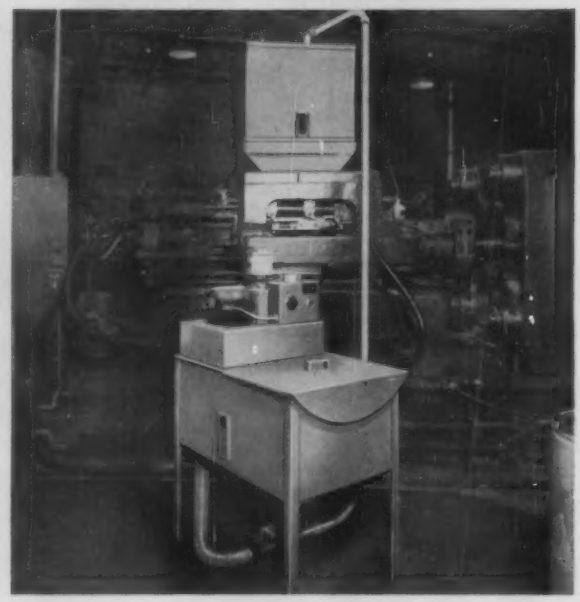
ASK THE RCA SALES REPRESENTATIVES

Agren-Ascher Company
Detroit, Michigan
Ambler Company
Denver, Colorado
W. G. Ballantyne Company
Portland, Oregon
F. H. Bathke Company
St. Paul, Minnesota
W. H. Del Mar Company
Los Angeles, California
Dixie Engineering Company
Birmingham, Alabama
J. Guy Griffith Company
Pittsburgh, Pennsylvania
Alfred Halliday Company
Louisville, Kentucky
Harris & Underhill Associates
Boston, Massachusetts
Heil Scientific, Inc.
St. Louis, Missouri
Hersey-Thomas Company
Greenville, South Carolina
Jones-Philibert Company
New Orleans, Louisiana
W. T. Kendall Company
Cuyahoga Falls, Ohio
Kornfeld-Thorp Company
Kansas City, Missouri
Robert L. Latimer
Philadelphia, Pennsylvania
M & R Sales
Dallas, Texas
Mills Engineering Sales, Inc.
Chicago, Illinois
W. W. Mills
Houston, Texas
Oneal Corporation
Jersey City, New Jersey
Henry P. Thompson Company
Cincinnati, Ohio
Western Sales Engineering Co.
Salt Lake City, Utah
L. P. Zumstein
Port Orange, Florida

Or write to Radio Corporation of America, Dept. K-75, Building 15-1, Camden, N. J. In Canada: RCA VICTOR Company Limited, Montreal.

Dries as it loads

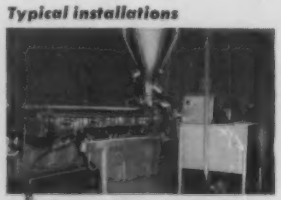
D & W HOPPER DRYER
and NEW combination Automatic
JET HOPPER LOADER



for all EXTRUSION and INJECTION machines...

- Dries and preheats material at less cost than with conventional drying ovens.
- More production because of properly controlled material conditioning—fewer rejects.
- Compact size saves space. Installed in minutes on any standard extrusion or injection machine.
- Dries and preheats as it loads. Requires no compressed air. Thousands proved in use.

Typical installations



Available for any size installation, large or small.
Write today for full information.

THORESON–
Serving the plastics industry
McCOSH, Inc.
18208 W. McNichols – Detroit 19, Michigan – KEnwood 1-8877

employed by truck and bus manufacturers to carry electrical cables beneath the chassis of the vehicle, and name plate fasteners, used in securing metal name plates to various types of equipment. The cable straps (photo p. 115), made of polyethylene, have a series of tapered projections that are drawn through a slot to tighten the strap around the cables and a molded hole at one end for attachment to the chassis. The name plate fasteners (photo p. 115), molded of nylon, are inserted into the drilled openings in the panel where the name plate is to be applied. Then integral studs on the name plate are inserted into the openings in the fasteners and pressure is applied, compressing the plastic sleeves so that they bulge on the back of the panel, gripping the studs and also forming a shoulder beneath the narrowed neck near the top of each fastener.

Plasti-Ring shaft retainers, another Fastex product (photo p. 115), molded of special oil- and grease-resistant elastomeric vinyl material, roll onto a grooved shaft without special tools, acting as a positive-holding shoulder highly resistant to friction and wear. The rings will withstand up to 250 lb. in direct shear; vibration and cycle tests have reached 10 million operations without failure. They are made in 17 standard sizes, including a type with an easily grasped removal tab for special applications. Typical applications of the rings are on relays, solenoid switches, cam shafts and emergency brake shafts.

While the above examples do not cover all types of plastics fasteners now available, they emphasize the variety of assembly jobs currently being performed by means of such fasteners. As new manufacturing problems arise, other types of plastics fasteners will be developed to meet them. But development will not be easy or inexpensive. Initially, some of these fasteners may be made by fabricating techniques or in single-cavity experimental molds until their ultimate design requirements have been determined and field testing completed. Then, if volume potentials indicate, full production may be set up with multi-cavity molds.—END

RC plasticizer DIDP-10

for wire coating applications!

TYPICAL ELECTRICAL CHARACTERISTICS		
Dielectric constant (ASTM D150-47T)	@ 60 cycles	4.34
	@ 1000 cycles	4.33
Power factor (ASTM D150-47T)	@ 60 cycles	0.65%
	@ 1000 cycles	0.05%
Volume resistivity, (ASTM D257-52T)	OHMS-CM	2.4×10^{13}

A modified di-iso-decyl phthalate with superior electrical properties plus low temperature flex in polyvinyl chloride compounds.

RC PLASTICIZER DIDP-10 economically imparts low volatility, low specific gravity and high resistance to water extraction in vinyl insulation compounds.

WRITE TODAY! Ask for our technical data sheet on DIDP-10. We'll be glad to send you samples.

RUBBER CORPORATION OF AMERICA

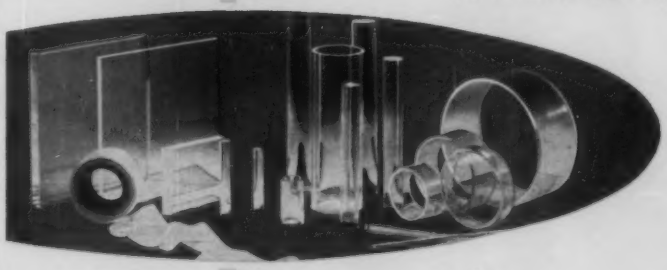
READY . . . RELIABLE . . . RC SERVING AMERICAN INDUSTRY SINCE 1930

New South Road, Hicksville 1, N. Y.

Sales Offices: NEW YORK • AKRON • CHICAGO • BOSTON

CHEMICAL PROGRESS WEEK APRIL 8-12

KAUFMAN ...The Nation's Supplier of All Plastics for Industry



LUCITE®
PLEXIGLAS®
VINYLITE
POLYSTYRENE
POLYETHYLENE
TEFLON
NYLON
FIBERGLAS
PHENOLICS
ACETATE
NITRATE
TYGON TUBING
KEL-F

SHEETS
RODS
TUBES

Send today for your free plastics catalog and price list.

KAUFMAN GLASS COMPANY PLASTICS DIVISION

1209-21 French St., Wilmington, Delaware • Ph. Olympia 4-2937

HARFLEX® 300

PERMITS A FREE FLOWING DRY BLEND

In a typical test, 64 parts of HARFLEX® 300, preheated to 212°F, were mixed with 100 parts of an easy-processing polyvinyl chloride resin at 212°F. After 30 minutes of thorough agitation, a dry, free flowing powder was obtained which could be put directly into an extruder. When a free flowing dry blend is used directly, as in extrusion operations, it is possible to eliminate or minimize extra operations such as Banbury mixing or roll milling.

HARFLEX® 300 is a permanent polymeric plasticizer, readily adaptable to dry blending. Write for our free technical bulletin that gives full information about HARFLEX® 300. Samples for your test or experimental work are also available at your request.

SEBACATES
PHTHALATES
ADIPATES

THE KEY TO HARCHEM® BETTER PLASTICS

HARCHEM DIVISION

WALLACE & TIERNAN, INC.
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY
IN CANADA: W. C. HARDESTY CO. OF CANADA, LTD., TORONTO

H-21

1. SELECT the items you want
2. CIRCLE the corresponding numbers on the post card
3. FILL IN the information requested
4. MAIL — no postage required

HELPFUL LITERATURE FREE

There is valuable data — worth dollars and cents to you — in the literature and samples described below.

EQUIPMENT • SUPPLIES • SERVICES

MOLDED PLASTICS MANUAL. 8-page booklet contains case histories of molded plastics applications developed by Illinois custom molding service that includes design, mold making, compression, transfer, injection molding. Also discusses company's "Insurok" laminated plastics. The Richardson Company. **(D-701)**

PORTABLE HEAT SEALER. Folder describes 4¾ lb. hand-operated heat sealer suitable for thermoplastic coated and laminated materials. Jaws are 6 in. long by ⅛ in. wide. Packaging Industries. **(D-702)**

PLASTICS EQUIPMENT. Catalog sheet contains illustrations, descriptions, and prices of injection and compression presses, extruders, mixers, ovens, embossing and laminating machines and Banbury mixers offered by New Jersey distributor. Johnson Machinery Company. **(D-703)**

"KEL-F" EXTRUSIONS. Literature contains price lists for line of stock extruded "Kel-F" trifluorochloroethylene plastic rods, sheets, and electrical spaghetti. Carmer Industries. **(D-704)**

HANDBOOK ON VACUUM METALLIZING. Illustrated 20-page booklet describes the vacuum metallizing process, discusses its uses. Includes description and specifications of line of vacuum metallizing equipment. F. J. Stokes Machine Company. **(D-705)**

GUIDING PLASTIC WEBS. Application bulletin describes five models of edge position control devices for use in laminating, printing, embossing, slitting and re-winding plastic film webs of all gages, moving at all speeds. Askania Regulator Co. **(D-706)**

MOLD RELEASE. Literature describes aerosol-packaged silicone spray mold release available in a 20-oz. container. Available with special valve that provides fine spray. Perc. E. Harms Co. **(D-707)**

INDUSTRIAL SCALES CATALOG. Illustrated folder describes and lists capacities of extensive line of industrial scales, including floor, overhead track, hopper, packing, counting, bench and portable types. Toledo Scale Company. **(D-708)**

POLYESTER RESINS. Literature describes line of polyester resins for hand layups, gel coats, matched molding, casting, and laminating, and provides specifications for resins in liquid, catalyzed and cured stages. Mol-Rez Corporation. **(D-709)**

SPRAY PAINTING MASKS. Illustrated folder describes electroformed metal masks for multi-color spray decoration of plastics surfaces. Illustrates use of different mask types, including types for special applications. Conforming Matrix Corporation. **(D-710)**

FILM FOR SILK SCREENING. Illustrated folder describes a solvent adhering film for silk screen process printing. Ulano Products Co. **(D-711)**

EPOXY TOOLING RESINS. 8-page illustrated folder describes line of epoxy casting resins and pictures patterns and core boxes cast from them. Gives casting in-

PLASTICS HANDLING EQUIPMENT. Illustrated folder describes pull-off unit designed for pulling extruded shapes such as belting, welting, hose; a tubing haul-off unit; and a turret winder that provides constant tension throughout roll build-up. Faeco Machine Company, Inc. **(D-713)**

INFRARED DRYING FOR LAMINATING. Illustrated report describes use of infrared oven for drying and curing resin-impregnated cloth or paper prior to laminating. Edwin L. Wiegand. **(D-714)**

BIMETALLIC EXTRUDER CYLINDERS. 16-page brochure describes company's extruder cylinders lined with metallic alloys for corrosion and abrasion resistance. Includes specifications and comparative strength charts. Industrial Research Laboratory. **(D-715)**

LAMINATED PLASTICS. Folder describes "Lamicoid" thermosetting laminated sheets, tubes and rods. Also contains illustrations of punched, machined, milled, and molded parts fabricated by this New York company. Mica Insulator Company. **(D-716)**

HEAVY DUTY RIPSAW. 8-page booklet illustrates principal features of a heavy duty gang rip saw suitable for plastics that can cut stock 24 in. wide by 3 in. thick. Mereen Johnson Machine Co. **(D-717)**

PLASTICS FOR ELECTRONICS. Loose leaf catalog contains technical data on company's epoxy casting resins, impregnating resins, potting compounds and laminating resins having special utility in the electronics field. Emerson and Cuming Inc. **(D-718)**

BLENDING DRY MATERIALS. Folder discusses conical blenders for dustless mixing of resins, plasticizers, dry colorants, pigments, and metal powders. Includes diagrams and capacities. General Machine Company of New Jersey. **(D-719)**

SPRAY PAINTING PLASTIC. Loose leaf catalog describes company's automatic spray painting equipment for plastic parts, masks for protecting surfaces while painting, and paint wiping equipment. Finish Engineering Company. **(D-720)**

URETHANE FOAM MANUAL. 16-page booklet tells how flexible and rigid urethane foam is made, illustrates fabricating methods, and discusses applications for insulation, and coatings. Includes sample pieces of flexible foam in several colors. Monsanto Chemical Company. **(D-721)**

LAMINATING AND MOLDING RESINS. Folder describes company's progress in the development of polyester laminating and molding resins, and ion exchange resins. Also discusses firm's adhesives. Chemical Process Company. **(D-722)**

MACHINERY AND EQUIPMENT FOR PLASTICS. Literature describes sheeting dies, plastics trimming press, extruder hopper for drying and blending, and a unit that glazes surface of plastics sheet. Goulding Manufacturing Company. **(D-723)**

THERMOPLASTIC SHEET AND FILM. Illustrated folder describes applications for rubber-modified styrene sheet, copolymer styrene sheet, and acetate, butyrate and polyethylene sheet and film. Price lists included. Chicago Molded Products Corp. **(D-724)**

Fill out and mail this card now

MODERN PLASTICS

MANUFACTURERS' LITERATURE SERVICE

Please send me the free items circled below. ☐ **I am a non-subscriber*** **I am** ☐ **a subscriber**

D-701 D-702 D-703 D-704 D-705 D-706 D-707 D-708 D-709 D-710 D-711
D-712 D-713 D-714 D-715 D-716 D-717 D-718 D-719 D-720 D-721 D-722
D-723 D-724 D-725 D-726 D-727 D-728 D-729 D-730 D-731 D-732 D-733
D-734 D-735 D-736 D-737 D-738 D-739 D-740 D-741 D-742 D-743 D-744

*If you do not have a personal subscription and would like to receive the next twelve monthly issues plus the next annual Encyclopedia Issue (U.S.A. & Canada, $7.00; Pan America $10.00; all others, $20.00) please check below.

☐ Check enclosed ☐ Send bill

NAME ..... POSITION .....
(Please Print Plainly)

COMPANY .....

STREET ..... CITY ..... STATE .....

(This card cannot be honored after July 1, 1957)

FREE HELPFUL LITERATURE

There is valuable data—worth dollars and cents to you—in the literature and samples described below.

1. SELECT the items you want
2. CIRCLE the corresponding numbers on the post card
3. FILL IN the information requested
4. MAIL—no postage required

EQUIPMENT • SUPPLIES • SERVICES

RESINS FOR GLASS REINFORCED MOLDING. File folder contains properties, uses and curing data for line of company's polyester resins which can be used for such articles as trays, fishing rods, boat hulls when glass reinforced. H. H. Robertson Co. (D-725)

USES OF EXPANDED POLYSTYRENE. Illustrated booklet describes expanded rigid polystyrene, suitable as an insulating material at temperatures below 175° F.; as a bouyancy material, and a packaging substance. Includes discussion of properties. The Dow Chemical Company (D-726)

POLYETHYLENE INFORMATION BOOKLET. 12-page booklet contains general discussion in non-technical terms of the uses, physical composition, development, processing and fabrication of polyethylene. Includes properties of company's polyethylene resins. U.S. Industrial Chemicals Company. (D-727)

EPOXY PRE-IMPREGNATED GLASS CLOTH. File folder contains samples, technical data sheet for "StanPreg", a flame-resistant, epoxy pre-impregnated glass cloth for use in laminates for electrical and electronic applications. Standard Insulation Company. (D-728)

SYNTHETIC WAX FOR PLASTICS PROCESSING. Illustrated folder describes chemical characteristics and qualities of a hard, hydrocarbon wax with a high-melting point. Said to improve moisture vapor, transmission characteristics of plastics. Moore & Munger. (D-729)

CUSTOM MOLDING SPECIAL PRODUCTS. Folder illustrates New Jersey company's production of special products by slush molding, dipping, pressure molding, foam molding methods. Also describes equipment available for compression, transfer, injection molding. Boonton Molding Company, (D-730)

PLASTICS MATERIALS BROCHURE. 12-page booklet describes company's polystyrene, cellulose acetate, PVC and ethyl cellulose molding powders; vinyl, cellulosic, polystyrene, and casein rigid sheet, flexible sheet and film. BX Plastics Products, Ltd. (D-731)

POLYMERIC PLASTICIZER. Technical bulletin describes a light-colored, high molecular weight polyester for use with polyvinyl chloride polymers and copolymers, cellulose acetate butyrate resins, nitro and ethyl cellulose, and synthetic rubbers. Emery Industries, Inc. (D-732)

EMULSIFIABLE POLYETHYLENE. 24-page technical bulletin describes wax-like polymer which improves wax emulsion coatings. Gives typical properties and discusses end uses and compatibilities with other materials. Allied Chemical and Dye, Semet-Solvay Petrochemical Division. (D-733)

REINFORCED PLASTIC. Technical bulletin describes "Scotchply," a moldable epoxy-glass laminate designed for production and supplied in roll or sheet form. Includes highly detailed properties charts and graphs. Minnesota Mining and Manufacturing Co. (D-734)

TESTING MATERIALS FOR WEATHERPROOFNESS. 26-page booklet describes laboratory unit that simulates weather conditions at accelerated speeds to test materials for ability to withstand outdoor exposures. Contains illustrations, discussions of principal working parts, and cross-section diagrams. Atlas Electric Devices Co. (D-735)

STOCK KNOB CATALOG. 16-page catalog describes line of stock thermoset plastic knobs. Line includes utility, pointer, bar, instrument, lever, and dual control lever types. Contains specifications and side-view diagrams for each knob classification. Kurz-Kasch Inc. (D-736)

PRESSES FOR REINFORCED PLASTICS. Illustrated folder describes and gives specifications for line of automatic-, semi-automatic, and manually controlled hydraulic presses with capacities of 25 to 300 tons. Dake Corporation. (D-737)

CONTINUOUS WEB PRINTING. Data sheet describes rotary flexographic press which prints trademarks, names, numbers, designs upon flexible materials .001 to .10 in. thick and up to 74 in. wide. Includes diagram of equipment, specifications. Adolph Gottscho, Inc. (D-738)

STYRENE AND VINYL RESINS. Illustrated booklet describes uses and typical properties of "Pilo-Tuf" high styrene resins, and uses of "Pliovic" vinyl chloride resins. Goodyear Tire & Rubber Company. (D-739)

VINYL EXTRUSION COMPOUND. 12-page brochure describes "Vygen 1101", a new unplasticized polyvinyl chloride compound for extruding operations. Tabulates physical and chemical properties; gives advantages, limitations, processing data. The General Tire and Rubber Company. (D-740)

WHITENESS AGENT FOR PLASTICS. Technical data sheet describes a soluble, colorless dye whiteness brightening agent, that can be used in vinyl chloride and copolymers, polystyrene, polyethylene, cellulose acetate. Geigy Industrial Chemicals. (D-741)

STEEL FOR MOLDS. Folder describes features and illustrates applications of prehardened die steel ready for use without further heat treatment for injection and compression molds. Heppenstall Co. (D-742)

THERMOPLASTIC SHEET MANUAL. Illustrated 8-page booklet contains case-history applications for "Royalite" thermoplastic sheet, made from a plastic copolymer and synthetic rubber, suitable for castings and housings, electrical applications, luggage, packaging, transportation. Contains forming and fabricating data and properties chart. U.S. Rubber Co. (D-743)

VINYL STABILIZERS. Folder describes applications for vinyl stabilizers in a wide variety of compounding operations. Recommended formulations for such end uses as plastisol spread and dip coatings, slush and centrifugal molding, and foam and sponge are included. The Harshaw

Fill out and mail this card now

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit 2656 (Sec. 34.9, P.L. & R.), New York, N.Y.

MODERN PLASTICS

Village Station Box No. 103

NEW YORK 14, N. Y.

SEEING IT..IS HALF OF *SELLING* IT

Joseph Davis Plastics

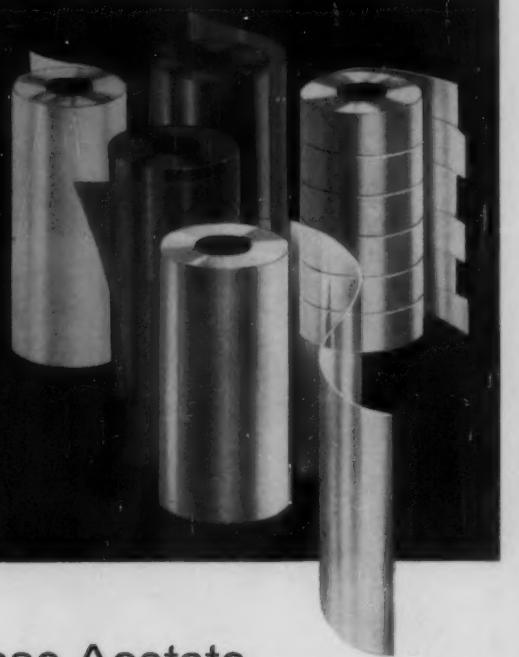
ACETATE SHEETS

and FILM are perfect for

VACUUM FORMING . .

BLISTER and

SKIN PACKAGING



JODA crystal clear acetate skin packaging provide excellent display and superior protection for this padlock and key set. By
CONTOUR PACKAGING
Phila., Pa.

Cellulose Acetate..
Hi-impact Styrene

Transparent, translucent, opaque..
light-to-heavy gauges

For further information and samples please contact

JOSEPH DAVIS PLASTICS COMPANY

Phone KEarny 2-0980-0981 JODA N. Y. BArclay 7-6421-6422

430 Schuyler Ave., Arlington, N. J.

Sales Representatives Conveniently Located

Volume and pressure

(*From pp.* 137-143)

travel curve for this material (Fig. 9E, Part I).

Durez 16274: Three parts were molded from this material. The first had a low charge weight and a pressure curve (Fig. 19A, p. 143) similar to that for the part made of a low charge weight of BM-120. When charge weight was increased, the curve in Fig. 19B, p. 143, was obtained. The part had typical fissure-type porosity. Another part was molded with this higher charge weight and with material that was preheated electronically before molding (Fig. 19C, p. 143). The molded part had only very slight porosity of the sponge type.

CTL-91LD impregnated glass cloth: A laminate was prepared from 60 plies of CTL-91LD impregnated 181 glass cloth. The plies were cut as shown in Fig. 20, p. 143, to give confinement by the cavity on either end with the resin free to flow on the sides. This trimming was done to simulate the type of confinement obtained in making flat panels when they are wrapped in cellophane. A "kiss" or pre-squeeze cycle, in which the press was closed to slightly more than contact pressure (for 3 min.), was used to heat the resin to the proper viscosity for lamination. The curve obtained (Fig. 21, p. 143) shows an initial hump at the time the pre-squeeze was applied and a second hump as the mold was closed to the lands. In both cases, the pressure dropped away very rapidly as the material flowed.

In the molded part, the spaces where the plies were trimmed were nearly, although not completely, filled with resin, and the part showed voids within 3/8 in. of the edge on both sides. Such voids usually indicate that the pre-squeeze time was too short. The nearly complete loss of pressure on the part is also evidence that the material was probably not advanced sufficiently prior to pressure application. Note also the presence of a slight third hump that was probably caused by the heating of the material as in the other cases discussed.

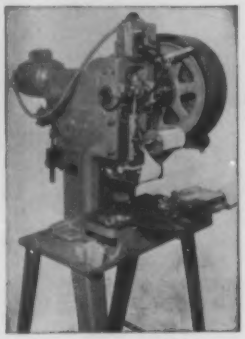
Conclusions

In a landed mold, high effective pressure on a part throughout the molding cycle does not alone ensure a non-porous structure. The use of slow closing times, dwelling and bumping, preheating of material, etc., may be required to produce non-porous parts. Low effective pressure, however, considerably increases the probability of porosity in moldings. The effective pressure obtained in a landed mold increases with increasing weight of charge of the molding material.

The techniques of pressure and punch-travel measurements described here have helped to clarify some of the complexities of the compression molding process. We hope that further studies will yield a deeper understanding of the process so that a systematic engineering approach may be taken to the problems involved in molding precise parts.—END

HOT STAMP

your plastic products and parts with tried and proven "well engineered" ACROMARK Model 2AH Hot Stamping Presses



- They were the first to mark thermosetting plastics successfully.
- They can be furnished with automatic slide or dial feeds.
- They can combine design, trade-marking and numbering operations on extruded or molded products.

Write for full details and send sketch or sample of products you want to mark for Engineer's recommendation.

ACROMARK

THE ACROMARK COMPANY

5-15 MORRELL ST., ELIZABETH, NEW JERSEY

"The Original Marking Specialists"

HEAT

For Plastic Processing

You Specify The Size

ELECTRIC HEATERS of All Types

Voltrap The Complete Contact Insulator

- For Machine Parts
- For Liquids
- For Air

ALSO SPECIAL REQUIREMENTS

INDUSTRIAL HEATER CO., INC.

245 CANAL ST., NEW YORK 13, N. Y.

SOLVIC COPOLYMERS

The following three materials are vinyl chloride — vinyl acetate suspension copolymers.

SOLVIC 513 P — Vinyl acetate content: ± 15%. PROPERTIES — Working temperatures: low; flow temperatures: very low (allows injection moulding without plasticizer). USES — LP records, vinyl-asbestos floor-tiles.

SOLVIC 523 K — Vinyl acetate content: ± 10%. PROPERTIES — Can be processed at low temperatures; easily produces clear sheeting or sheeting with transparent colours; permits extreme draws when made into sheeting for vacuum forming. USES — Rigid opaque, tinted or clear sheeting, deep vacuum forming.

SOLVIC 535 E — Vinyl acetate content: 5%. USES — General purpose copolymer.

SOLVIC POLYVINYLCHLORIDES

SOLVIC 100 series (122, 124, 136)
General- and special-purpose PVC resins, manufactured by the emulsion process; suitable for unplasticized extrusion and calendering, for blow-extrusion of unplasticized films, for injection moulding of unplasticized articles; Solvic 122 is prestabilized with non toxic products.

SOLVIC 200 series (235, 228, 235D)
General- and special-purpose PVC resins, manufactured by the suspension process; suitable for extrusion and calendering of plasticized articles; having excellent dielectric properties, Solvic 235 D is used for cable insulation.

SOLVIC 300 series (334, 336)
Paste-making PVC resins (plastisols and organosols); suitable for coating of fabrics and paper, dipping, hollow casting or slush molding, and soft cellular products.

Solvic is presently supplying PVC and copolymers in large quantities to plastic users throughout the world. In addition, Solvic manufactures PVC compounds and colour concentrates (master-batches) under the trade name, BENVIC.

SOLVIC BELGIUM
SOLVIC FRANCE
SOLVIC ITALY
SOLVIC

Write for additional technical information.

SOLVIC S.A., 244, Rue de la Loi BRUSSELS (Belgium)

Affiliate companies in Austria, Brazil and Spain

BATTENFELD

INJECTION MOLDING

machines give you

1. LOWEST INITIAL COST
2. LOWEST OPERATING COST
3. LOWEST MAINTENANCE COST

plus:

- FULLY AUTOMATIC MOLDING
- WEIGHT FEEDERS AS STANDARD EQUIPMENT
- TWO SEPARATE MOLD PROTECTION SYSTEMS

SOLD AND SERVICED BY MOLDING SYSTEMS INC. DANIELSON, CONNECTICUT

Factors affecting

(*From pp.* 123-136)

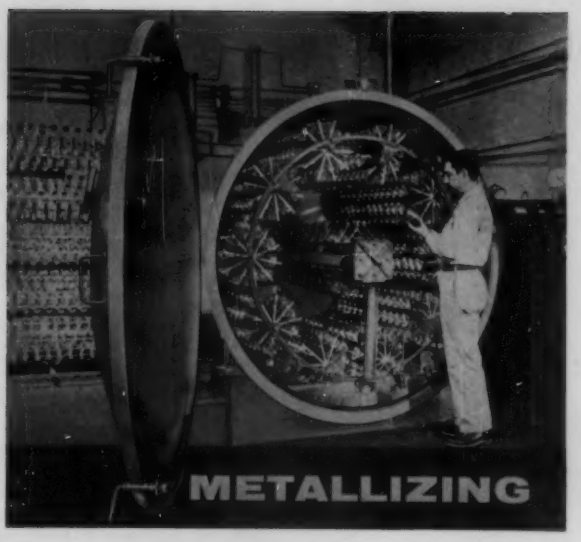
simultaneously increasing the pressure would result in quality degradation. In effect, the productive output capacity of the extruder has been reached as a result of its inability to maintain a satisfactory quality level, although there is obviously reserve capacity both in screw speed and available drive power. By raising the pressure and screw speed to point *B* (2600 p.s.i. at the maximum screw speed of 84 r.p.m.), it is seen that a rate of 65 lb./hr. of good product would be possible. This is the true capacity of the system at temperature 1. By raising the machine temperatures to a higher level, 2, the quality limit line moves upward to a position through points *C* and *D*, thus accomplishing a further increase in output.

It is also seen in Fig. 19 that with a low resistance die, requiring pressures of 1000 p.s.i. or less, the degree of mixing would not be sufficient for high quality production. By insertion of an adjustable valve between the extruder and the die, the pressure level could be increased to bring the operating point into the good quality range. The use of such a valve in extruding polyethylene sheeting is illustrated in Figs. 20 and 21.

The effects of mechanical work on product quality are found to be very similar to the effects of pressure. This quantity, although it plays an important role in determining the degree of mixing, is now considered to be the result of a combination of other effects, and not an independent extrusion variable.

Type and degree of mixing

The design of the screw plays a large part in determining the type and degree of mixing accomplished. The screw employed in the preceding investigation, a relatively deep-channel, decreasing-pitch type, was chosen because of its sensitivity to operating variables. While this type of screw is still used in some applications, shallower-channel, metering-type screws are less subject to many of the variabilities previously described and are considered more universally adapt-



Here is one of Premier's three high volume vacuum metallizing machines applying a shiny metallic finish to plastic flash gun reflectors. These reflectors are only one of hundreds of different products which can be finished in gleaming silver, gold, brass, copper or any other color.

If you are a manufacturer or user of molded plastics—such as styrenes, phenolics, acetates, etc., it will pay you to investigate vacuum metallizing. We will prepare samples of your items at no cost or obligation.

For more information on how vacuum metallizing can make money for you, write or call today.

Premier Vacuum Process Corporation
58-87 55th St., Maspeth, New York, Phone: EVergreen 6-0738

PERMANENT CONTAINER DECORATION . . .

expertly executed, enhances the eye-appeal of your products at the right point—THE POINT OF SALE.

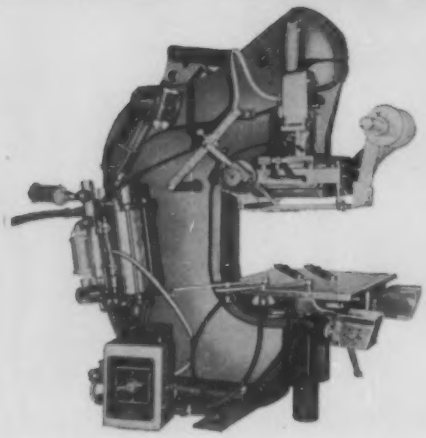
- SILK SCREENING
- OFFSET PRINTING
- HOT STAMPING

Electronic QUALITY CONTROL insures SUPERIOR QUALITY on small runs, large runs or re-runs.

Pen a post card for samples giving you a true eye-view of what PERMANENT'S Know-How and Can-Do achieved for other progressive manufacturers.

PERMANENT LABEL CORPORATION
49 ACKERMAN STREET
Bloomfield, N. J. - EDison 8-6200

Announcing! A New Plastic Marking Machine



KENSOL 60
Roll Leaf Stamping Press Shown
with 6x9 inch Roll Leaf Attachment

OLSENMARK Corporation
124-132 WHITE ST., NEW YORK 13, N. Y.

The **KENSOL 60**
EXTRA HEAVY DUTY
ROLL LEAF STAMPING PRESS

Featuring

- 3 inch head stroke with 8½ inch opening from head to table. Will imprint items up to 5½ inches high.
- Extra heavy "C" style frame, toggle links and pins. Built for many years of rugged use.

Available with

- One or two air cylinders. When equipped with two cylinders, enough pressure is developed to mark thermo-sets. Second cylinder can be inactivated for light work.
- Standard head sizes of 6" x 9" or 8" x 12". Special heads have been made up to 24" wide to mark refrigerator parts, etc.

Write for complete data!

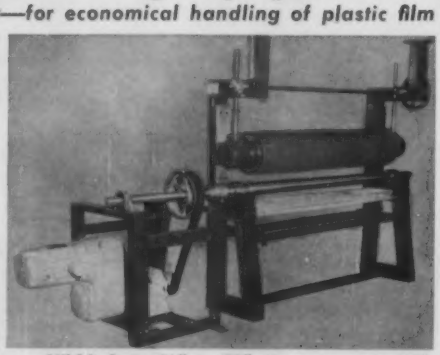
- Literature will be sent on complete line of Kensol Equipment which includes hand operated and power operated presses, turntables, etc.
- Roll leaf color chart showing complete line of Olsen Mark Leaf will also be sent.

Specialists in Quality Marking Equipment and Supplies for over 30 years

STEP UP PRODUCTION with low cost Liberty processing equipment

The Liberty One Color Printer—for economical handling of plastic film

- Engraved cylinder can be changed in a matter of minutes.
- Copper cylinders easily removed, and can be washed up while on the press.
- When printing from the doctor blade, press gets under way with only a pint of ink. And only two or three quarts are required when using the ink pan.
- Doctor blade and cylinder in full view at all times.
- All steel construction. Ball bearings throughout.



Width from 48" to 72". Repeats up to 24".

Liberty's wide range of processing equipment includes *polishing units, embossers, one and two color presses, inspection units.* Write for your copy of the Liberty catalog and get complete information on all Liberty units.

LIBERTY MACHINE CO. INC.
275 FOURTH AVENUE • PATERSON 4, N. J.

able for polyethylene extrusion. The basic effects of the several operating variables, however, are the same for any screw.

While extrusion quality has been evaluated and discussed in terms of color dispersion, this is not always the particular quality aspect of concern to the commercial extruder. Poor mixing is a manifestation of mechanical and thermal non-homogeneity which may show up in other ways, namely: roughness, lumpiness, or waviness in heavy sections, hard particles, lack of gloss, poor clarity, low strength, or other shortcomings in thin films. It has been indicated that the mixing efficiency of a given system can be altered in several ways but the user must still decide which of the available methods may be applicable in his case. Since one of the necessary end results for improved mixing is usually an increase in mechanical work, it should be realized that this additional energy must come from some source. The mechanical work can be increased either by raising the operating pressure or by cooling the screw, both of which cause a reduction in output rate for a given screw speed, but little change in drive power. If latitude in screw speed range and drive power are available, the rate can be brought back to the original level and often higher by raising the screw speed, with a corresponding increase in power consumption. Where screw speed or available power are limiting factors, quality improvement is generally accomplished only at the expense of output.

Control of mixing efficiency

The relative advantages of the various methods of quality control may depend upon a number of operating or economic factors.

A considerable quantity of heat is removed and essentially thrown away by screw cooling. Since this heat must be purchased, the cost of this method of control must be weighed against the advantages obtained. In some areas, the availability of cooling water, as well as its cost, may even be a more serious deterrent. Certain advantages of screw cooling have been defined—mechanical work is in-

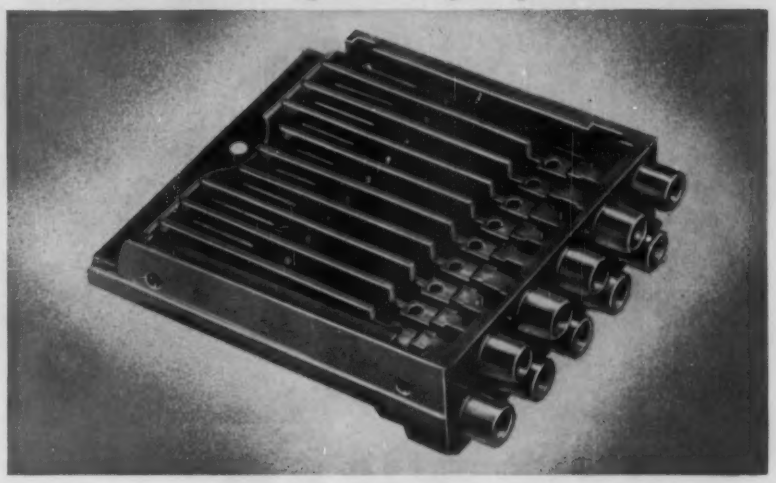
creased, resin temperatures are reduced (sometimes a desirable or necessary effect), and product quality is generally improved. In some cases the desired effects could be accomplished by a change in screw design. It has been shown, for example, that by reducing the channel depth in the metering section to as low as 0.062 in., as with screw No. 1, good mixing and quality are almost always obtained under neutral operating conditions. True, the output rate per r.p.m. and the drive power economy are lower than with a deeper channel screw, but if it were necessary to operate the latter at a low screw temperature to achieve the same quality level, then the output rate would probably be no greater and the over-all economy much less.

Control of the pressure variable to improve mixing efficiency and product quality is less costly than screw cooling since the cost of cooling water and the heating thereof are absent, although the output rate is thereby reduced for a given drive power input. This method is preferred and recommended wherever practicable. The pressure is easily adjusted by means of a valve between the head and the die, together with a pressure gage and an immersion thermocouple in the head or between the head and the valve; the effects thereof are readily ascertained. When a given quality limit is exceeded, it can generally be brought back under control by raising the pressure and screw speed to maintain or increase the output rate of acceptable product. This offers a continuous method of control as opposed to the use of screen packs to increase the operating pressure, although a certain minimum amount of screening may be desirable to remove possible foreign contamination. It also provides a means for establishing optimum pressure conditions for each specific application or product and for a day-to-day duplication of such conditions. Adaptation of pressure control principles to further automation of extrusion processes is also visualized.

Modification of head, adapter, or die design may be necessary to incorporate pressure measuring

PRECISION PLASTIC MOLDING

to critical engineering specifications



American Insulator specializes in molding precision plastic parts that reduce final assembling and finishing costs for manufacturers.

Since 1916, Aico molded plastics have helped many of America's leading industries attain product improvement, quality refinement and reduction of manufacturing costs. Aico precision molded plastics are easily adapted to new or existing designs, and can be molded to the most critical tolerances. Aico offers you 3 valuable guides that let you decide, in the privacy of your own office, if you should convert your product to plastics. They're free . . . send coupon for your copy today.

Can Aico Molded Plastics Help You?

Send for these free guides . . . then, YOU decide.

AICO PLASTICS APPLICATOR . . . tells at a glance which plastic is best suited for your product, and how it should be molded.

AICO FACILITIES BOOK . . . describes equipment needed to provide a complete molding service. A valuable guide to selecting a single, fully-equipped molder. Tells how to avoid annoyance and waste of split responsibilities.

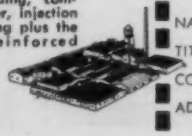
REINFORCED PLASTICS BOOK . . . tells all about these amazing new materials that are strong as steel—light as aluminum.

AMERICAN INSULATOR

CORPORATION

NEW FREEDOM, PENNSYLVANIA

A complete plastics molding service including engineering, mold building, compression, transfer, injection and cold molding plus the molding of reinforced fiberglas.



Send me the Aico literature checked. ☐ Aico Plastics Applicator ☐ Reinforced Plastics Book ☐ Aico Facilities Book.

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

How to give your plastics the beauty of

PEARL

with

NACROMER®

Incorporated into any thermoplastic resin, or as a coating on any plastic, Nacromer adds a distinctive pearl-like lustre to any product at amazingly low cost. Either method produces excellent results — unique effects impossible to achieve any other way.

Incorporated into the plastic itself (polystyrene, polyethylene, polyesters, acetates, vinyls, etc.) Nacromer provides a pearlized effect with no changes required in your usual molding or casting process. Nacromer is easily mixed into your plastic by hand, in a Banbury, or on the rolls . . . or your compounder can supply you with ready-mixed resins containing Nacromer.

As a coating, you merely add Nacromer to your present coating material and apply by your usual method (spray, brush, or dip). No additional finishing operations are required. The addition of transparent dyes makes possible unlimited colors and effects.

Either way you use it, Nacromer will make an immediate improvement in the sales appeal of your products. **Mail the coupon below for more complete information and demonstration samples.**

the **Mearl** corporation

"World's Largest Producers of Pearl Essence"

THE MEARL CORP., 147 Waverly Place • New York 14, N. Y.

Please send more information about Nacromer.

☐ We want to incorporate it into _____.

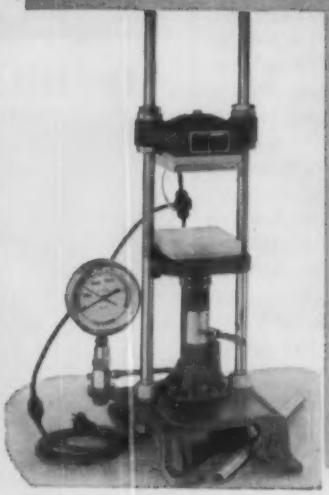
☐ We want to use it as a coating.

Name _____

Company _____

Address _____

The CARVER LABORATORY PRESS



. . . Solutions for Pressing Problems

Accurately controlled pressures to 20,000 lbs.; 6-inch gauge mounted on base. Carver Standard Accessories include Electric or Steam Hot Plates, Carver Test Cylinders, Swivel Bearing Plates, Cage Equipment. Available from stock. Write for catalog.

FRED S. CARVER INC.
HYDRAULIC EQUIPMENT
3 CHATHAM ROAD, SUMMIT, N. J.

22%
PRICE REDUCTION

Bomb-Lube

the original patented formulation

★ now in 20 oz. Super King cans
★ 66⅔% larger than old type cans
★ far superior to ordinary silicones

LOW PRICES!

12 Super King 20 oz. containers to a case

Less than case 2.50 per can

1, 2 or 3 cases 1.90 per can

4 or more cases 1.75 per can

F.O.B. our plant, N.Y.C.

Bomb-Lube is superior to and cheaper than ordinary silicone releases regardless of quality.

PRICE-DRISCOLL CORP
520 Fifth Ave., New York 36, N. Y.
IN LONDON, ENGLAND
Bomb-Lube, 10/12 Bosworth Road

and control devices in existing equipment, but is felt that the rewards are well worth the expense and effort involved. There is also room for improvement in design and streamlining of available high-pressure valves, but this will come with application of engineering ingenuity.

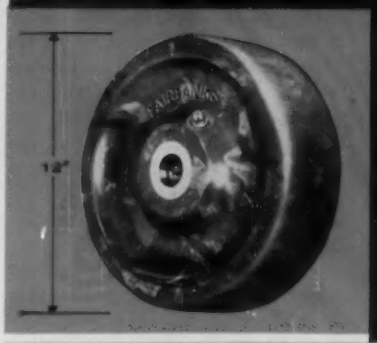
The pressure method of quality control offers advantages in the majority of applications, particularly in those where a high resin temperature is desirable, as in flat film or sheeting and extrusion coating. Where low resin temperatures are preferred for reasons of cooling or handling of the extruded product, such as in tubular film or pipe, the screw cooling method may prove more satisfactory.

References

1. Pigott, W. T., "Pressures developed by viscous materials in the screw extrusion machine," Transactions of the ASME, (Oct. 1951).
2. Carley, J. F., Jepson, C. H., Mallouk, R. S., McKelvey, J. M. and Strub, R. A., "Extrusion Symposium," Ind. Eng. Chem. *45*, (May 1953).
3. Carley, J. F., Gore, W. L., and McKelvey, J. M., "Principles of plastic screw extrusion." SPE J., (March 1953).
4. Maillefer, Charles, "An analytical study of the single-screw extruder," Brit. Plastics, (Oct. and Nov. 1954).
5. Bernhardt, E. C. and McKelvey, J. M., "Adiabatic extrusion of polyethylene," SPE J., (March 1954).
6. Gaspar, E., "Fundamental problems of single screw thermoplastic extruders," Plastics Progress, (1955).
7. Gaspar, E., "Problems and trends in European extruder design," SPE J. *12*, 23 (Oct. 1956).
8. Maddock, B. H., "Fundamental mechanisms in polyethylene extrusion," SPE J. *12*, 49 (Oct. 1956) and *12*, 50 (Nov. 1956).
9. Grant, D. and Walker, W., "Problems of mixing in extrusion," Plastics Progress, (1951).
10. Tordella, J. P., "Melt fracture—extrudate roughness in plastics extrusion," SPE J. *12*, 36 (Feb. 1956).—END

MIN CHEMISTRY *at work*

case: Great impact strength, denseness, imperviousness, and superior heat and abrasion resistance obtained with ASP 400 filler at high loading



This is "Lamilon"—internationally-known "family" of nylon-reinforced all-plastic caster wheels in diameters from 3" to 12" made by The Fairbanks Company, New York 3, N. Y.

Mineral Filler Report: Fairbanks states M & C's ASP 400 Aluminum Silicate Pigment filler gives unmatched performance as follows:

a. ASP 400 provides "synergistic wetting and combining action" giving wheels a much higher heat distortion factor than nylon, resin or filler possess in themselves.

b. "Lamilon's" impact strength is double the industry standard . . . water absorption is 90% under . . . abrasion resistance so superior it sets a *new* standard.

c. Long pot life, molding ease, no catalytic effects, no viscosity problems at high loading.

Our business is to supply low-cost non-metallic mineral products that are *process-engineered* to make things go smoothly in your plant . . . well in your markets. Use the coupon.

MINERALS & CHEMICALS CORPORATION OF AMERICA
2655 Essex Turnpike, Menlo Park, N. J.

I'm interested in a natural mineral product for_____

_____

Send: ☐ Detailed plastics literature ☐ Free samples

name_____ title_____

company_____

address_____

city_____ zone____ state_____

For more data, see Chemical Materials Catalog Pages 330-334

MINERALS & CHEMICALS
CORPORATION OF AMERICA
2655 Essex Turnpike, Menlo Park, N.J.

Leaders in creative use of non-metallic minerals
ATTAPULGITE (*Attapulgus*)
ACTIVATED BAUXITE (*Porocel*)
KAOLIN (*Edgar • ASPs*)
LIMESTONE (*Chemstone*)
SPEEDI-DRI FLOOR ABSORBENTS

SERVICE AND STOCKS IN 30 CITIES

One-piece phone

(*From* p. 117)

number of soldering points, terminal screws, wires, etc., by nearly 50 percent.

The three-piece plastic housing, when assembled, stands 9¼ in. high and measures only 4½ by 3⅞ in. at its base—less than one-half the size of the standard telephone. The main body of the housing is molded in two halves that are cemented together. Future plans call for the body to be molded in one piece. The third molded section is the shield-shaped earpiece. The receiver mechanism is attached to the back of this earpiece and the complete unit is then permanently cemented onto the case. Finally, the dial face with the assembled chassis is fastened to the base of the housing by means of four screws which pass into metal retainers set into slots molded into the housing.

Because of the unique single-unit construction of the instrument, using the Ericofon calls for a novel approach. Instead of reaching for the dial, the user holds the Ericofon in one hand at a convenient angle and dials with the other. The transmitting unit is located in the base of the housing while sound is relayed to the Ericofon user through the receiver unit in the top half of the housing.

To perform the usual line-connection functions handled in conventional phones by the cradle switch button, a molded nylon "Standswitch" button is located in the center of the dial face. When the Ericofon is lifted, the Standswitch releases to effect the connection; when the Ericofon is placed back on its base, the Standswitch is depressed, thereby disconnecting the phone.

Although the entire telephone mechanism is thus compacted into a single unit, the light weight of the styrene-acrylonitrile housing helps keep the total weight of the instrument down to about 15 ounces. In addition, the adaptability of plastics to the simplified, easy-to-mold, easy-to-assemble three-piece construction of the housing was translated into important savings in production costs. And despite its simplicity, the housing is a highly decorative unit functionally styled to facilitate lifting and holding. The plastic housing is available in six colors—ivory, green, red, blue, light grey, and dark grey—which further contributes to the design element. The part has excellent strength, good scratch resistance, and resistance to acids.

The other two plastics materials used to any extent in the construction of the Ericofon are acrylic and nylon. Acrylic is found in the finger hole dial wheel and transparent dial cover plate. Letters and digits are printed on the reverse side of the plate to protect them from scratching or wearing. Nylon is used for the Standswitch button, as well as in an impulse wheel in the telephone mechanism and the dial mechanism main drive gear—mainly because of its toughness, scratch resistance, and self-lubricating qualities.—END

DYNATHERM ELECTRONIC HEAT SEALERS

YEARS AHEAD in

- FEATURES
- PERFORMANCE
- PRICE

EXCLUSIVE:

- HEAVY DUTY INTEGRATED UNIT
- PATENTED SWING DOOR
- TAKES LESS FLOOR SPACE THAN ANY UNIT ON MARKET
- CENTRAL CONTROL PANEL

SIZES
1 to 10 kw — IN STOCK
12 to 50 kw — ON ORDER

WRITE FOR FREE CATALOGUE

Dynatherm Division
GUILD ELECTRONICS, Inc.
388 BROADWAY • NEW YORK 13, N. Y.

BALLS UNLIMITED

FOR UNLIMITED APPLICATIONS

We specialize in the manufacture of precision balls in desired diameters made from non-metallic materials including.
ACETATE BUTYRATE POLYSTYRENE
NYLON TEFLON LUCITE EPOXY
STYROFOAM WOOD CORK FIBER
Remember, only a *ball* does the *job of a ball.*
So consider a ball for your purpose—and consider the job well done by ORANGE PRODUCTS.

Small turnings of cylindrical shapes formed from round rods and tubes for all types of applications.

Range of sizes is from ⅛" to 1" diameter and up to 7" long. We hold tolerances of .002 on plastic and .005 on wood, plus or minus.

ORANGE PRODUCTS, INC.
554 MITCHELL ST., ORANGE, NEW JERSEY

Theoretical study

(*From pp. 145-156*)

us the way in matters of thermodynamics and physical chemistry; Alvin R. Nielsen, Mrs. Janet A. Pease and the other members of the Plax laboratory, for their cheerful cooperation in grinding out the laborious data; J. H. Parliman, technical service manager, and C. Paul Fortner, vice president in charge of research, both of Plax, for technical direction and guidance. A special vote of thanks is due the U. S. Air Force for its confidence in sponsoring a project so vital to the packaging future of polyethylene.

Selected bibliography

1. "The Permeability of Different Rubbers to Gases and its Relation to Diffusivity and Solubility," G. J. Van Amerongen, *J. App. Phys. 17,* 972 (1946).

2. "Solubility, Diffusion, and Permeation of Gases in Guttapercha," G. J. Van Amerongen, *J. Poly. Sci. 2,* 381 (1947).

3. "The Diffusion of Some Organic Substances in Polystyrene," G. S. Park, *Trans. Far. Soc. 47,* 1007 (1951).

4. "The Diffusion of Some Halo-Methanes in Polystyrene," G. S. Park, *Trans. Far. Soc. 46,* 684 (1950).

5. "Diffusion in High Polymers: Some Anomalies and Their Significance," Crank and Park, *Trans. Far. Soc. 51,* 10072 (1951).

6. "Diffusion of Organic Vapors into Polyvinyl Acetate," R. J. Kokes and F. A. Long, *J. Am. Chem. Soc. 75,* 6142 (1953).

7. "Theory of D_o for Atomic Diffusion in Metals," Zener, *J. App. Phys. 22,* 372 (1951).

8. "Influence of Structure on Polymer-Liquid Interaction. I. Relative and Absolute Values of Swelling Equilibria," G. Salomon and G. J. Van Amerongen, *J. Poly. Sci. 2,* 355 (1947).

9. "Influence of Structure on Polymer-Liquid Interaction. III. Swelling and Mechanical Properties of Some Partly Crystallized Polymers," G. Salomon, *J. Poly. Sci. 3,* 776 (1948).

10. "The Interaction Between Rubber and Liquids. VIII. A New Examination of the Thermodynamic Properties of the System Rubber + Benzene," Geoffrey Gee and W. J. C. Orr, *Trans. Far. Soc. 42,* 507 (1946).

11. "The Phase Equilibria Between a Crystalline Polymer and Solvents. I. The Effect of Polymer Chain Length on the Solubility and Swelling of Polythene. II. The Effect of Solvent Type on the Solubility and Swelling of Polythene," R. B. Richards, *Trans. Far. Soc. 42,* 10-28 (1946).

12. "Swelling and Solubility in Mixed Liquids," Geoffrey Gee, *Trans. Far. Soc. 40,* 468 (1944).

13. "Determination of Polymer-Liquid Interaction by Swelling Measurements," Paul Doty and Helen S. Zable, *J. Poly. Sci. 1,* 90 (1946).

14. "Some Thermodynamic Properties of Slightly Cross-Linked Styrene-Divinylbenzene Gels," R. F. Boyer and R. S. Spencer, *J. Poly. Sci. 3,* 97 (1948).

15. "Thermodynamics of High-Polymer Solutions. III. Swelling of Cross-Linked Rubber," R. L. Scott and M. Magat, *J. Poly. Sci. 4,* 555 (1949).

16. "Equilibrium Sorption of Several Organic Diluents in Polyvinyl Acetate," R. J. Kokes, A. R. DiPietro, and F. A. Long, *J. Am. Chem. Soc. 75,* 6319 (1953).

17. "The Effect of Temperature on the Density of Polyethylene," E. Hunter and W. G. Oakes, *Trans. Far. Soc. 41,* 49 (1945).

18. "The Heat Capacity, Heat of Solution, and Crystallinity of Polyethylene," H. C. Raine, R. B. Richards, and H. Ryder, *Trans, Far. Soc. 41,* 56 (1945).

19. "The Melting of Polythene," R. B. Richards, *Trans. Far. Soc. 41,* 127 (1945).

20. "The Texture of Polythene," C. W. Bunn and T. C. Alcock, *Trans. Far. Soc. 41,* 317 (1945).

21. "The Molecular Structure of Polyethylene. I. Chain Branching in Polyethylene During Polymerization," M. J. Roedel, *J. Am. Chem. Soc. 75,* 6110 (1953).

22. "The Mechanical Properties of High Polymers," H. Mark, *Trans. Far. Soc. 43,* 447 (1947).

23. "Elastomers and Plastomers. I. General Theory." Edited by R. Houwink. Elsevier Publishing Co. (1950).

24. "The Solubility of Nonelectrolytes," Hildebrand and Scott. Reinhold. (1950).—END

STEARATE

HEADQUARTERS

METASAP

There are ample and compelling reasons why Metasap, the nation's largest producer of stearates, is known from coast to coast as "Stearate Headquarters". The unvarying uniformity and extreme purity of Metasap Stearates are recognized wherever stearates are used. If you have special needs—Metasap is equipped to formulate custom-made stearates to meet them.

Our skill with stearates is complemented by our nation-wide distribution facilities. Whatever your needs, you'll fill them best by submitting them to "Stearate Headquarters"—Metasap.

Stearates of:

Aluminum *Lithium*
Barium *Magnesium*
Calcium *Zinc*
Lead

Also:

Aluminum Palmitate
Zinc Palmitate
Aluminum Octoate

METASAP CHEMICAL COMPANY

Harrison, N. J.
Chicago, Ill. • Boston, Mass.
Cedartown, Ga. • Richmond, Calif.
London, Canada

A NOPCO Subsidiary

The Cleanest Stearates Made!

Services to Industry
important to you!
Carroll's more than 50 years of specialized services in sheet plastics can assist in solving your design and production problems. Carroll services are rendered with infinite care and precision.
Plastic Printing
Laminating
Precision Fabricating
Die Cutting
Vacuum Forming
TRICKS OR TREATS
We invite your inquiry for further information.
J. B. CARROLL COMPANY
Albany and Carroll Avenues
Chicago 12, Illinois

Dryer

2
GREAT AIDS
IN HANDLING
THERMOPLASTIC
MATERIAL

WHITLOCK

WHITLOCK AUTOMATIC HOPPER DRYER

Dries the material faster and more effectively, holding to a predetermined temperature. Proved successful on nylon, acrylic, butyrate—also on other materials where surface moisture is a problem.

WHITLOCK AUTOMATIC HOPPER LOADER

Transfers materials automatically from any container at floor level to hopper. Keeps materials at a constant level in the hopper, insuring a uniform supply to the heating cylinder.

Write for Literature

C. H. WHITLOCK ASSOCIATES
21651 COOLIDGE HIGHWAY
OAK PARK 37, MICH.

Hopper Loader

High-loading rate

(*From pp.* 158-166)

are conspicuous examples of markedly similar effects on materials which are similar in composition. All of the polyethylene materials (Nos. 5, 6, and 7) show relatively little increase in strength with increase in rate. However, some increase is shown and this increase is greater with increasing molecular weight. The polyvinyl chlorides (Nos. 11-17) all show very marked increase in strength at high rates. A more refined analysis of the similarities or differences among these materials does not seem possible, because the high rate tests were performed in time intervals from 0.007 to 0.016 sec., and Fig. 4 shows that a difference in 0.003 sec. can actually result in a difference of approximately 1000 p.s.i. in strength.

The only glass-reinforced plastic tested—a fibrous glass-filled polystyrene (material No. 20)—showed the greatest actual increase in strength with increase in rate although this was a lesser percentage increase than was shown by some of the polyvinyl chlorides.

Aside from these few generalizations, it can only be said that increasing rate produced higher tensile strengths for all materials.

Based upon actual experience with the impact resistance of various plastics, that is, with their strength characteristics at high rates, a person acquainted with plastic materials might have expected some differences in these data which it turns out are not there. For example, if all of the more impact-resistant plastics had increased in strength sharply with increase in rate while the less impact-resistant materials had not, an experienced plastics observer would probably have felt that these data explained the observed impact performance. On this basis, it might have been expected that the polyethylenes would have shown sharply increased strengths at high rates; also, that the modified polystyrenes would have shown sharp increases with rate while the unmodified polystyrene would have shown no increase or even a de-

crease. Of course, all of these expectations would have been contrary to what is actually observed. We can only conclude that strength by itself probably does not account for impact resistance in practice and that an explanation of actual impact resistance will have to await at least the additional evidence provided by simultaneous strain measurements.

In the case of tests at both low rates, it will be observed that there is a consistent trend toward shorter testing times at lower strengths. These trends are definite but have no particular significance, because, of course, they are inevitable for determinations performed at constant rates of load increase. As long as any one rate of load increase is faithfully maintained, all weaker materials will break in a shorter time than stronger materials, and, in fact, there will be a definite and predictable breaking time for any given strength.

Conclusions

These data confirm the general expectation that increasing the loading rate into the millisecond range usually increases tensile strength significantly. Quantitative data are now presented to show just how tensile strength does change in going from the usual laboratory rates to rates in which failure occurs in from 0.006 to about 0.040 second. The increase or decrease with rate varies greatly from composition to composition but seems likely to be similar for very closely similar compositions. Good impact performance in practice apparently involves more than high strength, and a complete explanation of performance under impact conditions will at least require strain data in addition to strength data.

This report adds considerably to the very limited published data on strengths of plastics at constant rate of load increase at low rates.

Acknowledgements

The authors are indebted to Messrs. B. Holman and M. Chmura for their aid in the preparation of this work.—END

You get a
Superior Finish
with Stypol Resin

In the plant of a midwest custom molder, a Robertson Resin Engineer (right) inspects the final result of his technical assistance and the successful use of Robertson Stypol resin reinforced with glass fiber.

Robertson Stypols (polyesters) have an unusual ability to bury glass fibers so that the surface of molded parts is very smooth to the touch and attractive to the eye. In addition, these resins offer outstanding craze and blow resistance on short high temperature cure cycles, plus far better than average hot strength and mold release properties particularly in complex large moldings. Clip the coupon below and attach it to your letterhead if you would like a qualified Robertson engineer to work in your shop with you on your specific problem.

ROBERTSON STYPOL RESINS

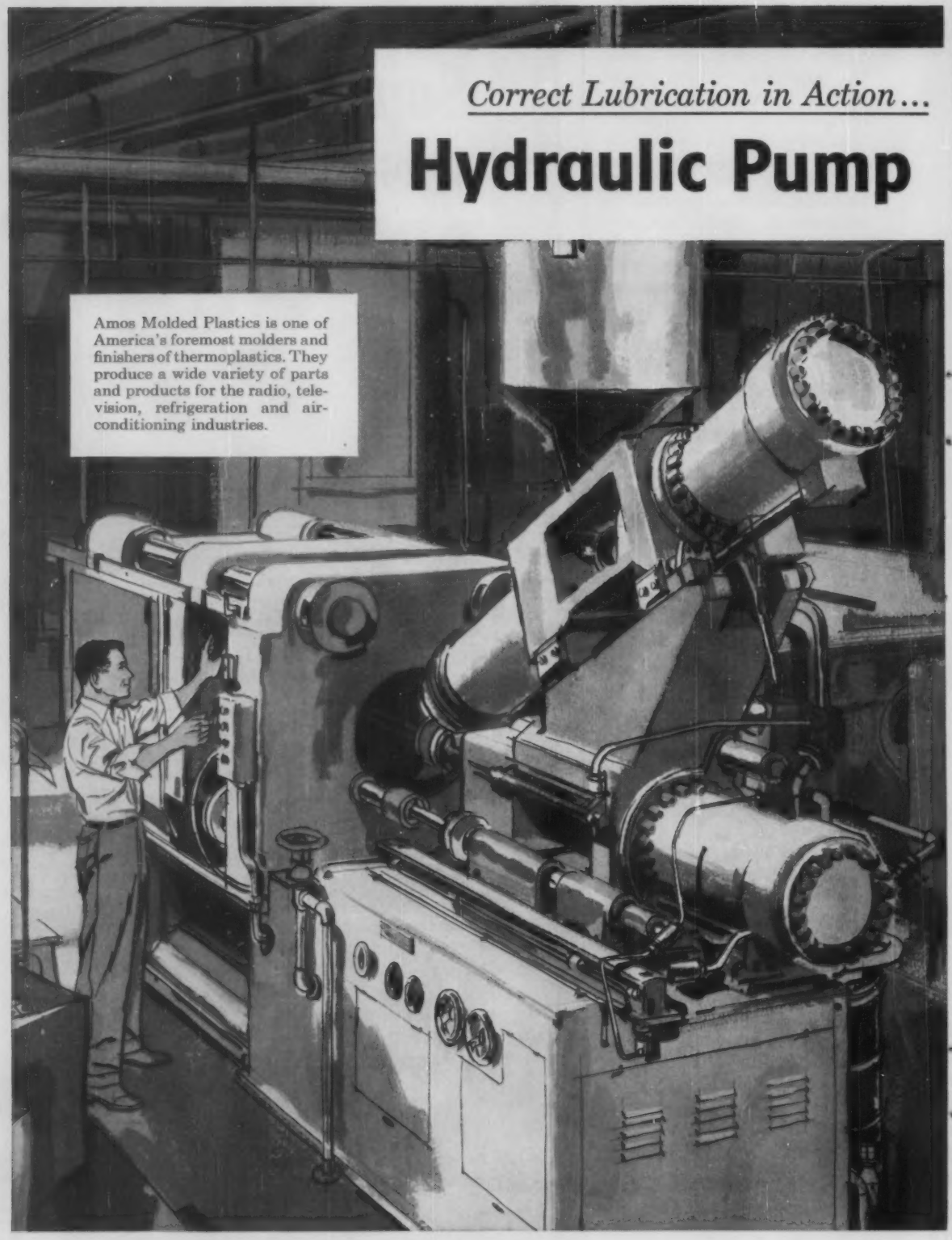
*One of the world's largest producers of specialty asphaltic and polyester compounds

H. H. ROBERTSON CO.
2444 Farmers Bank Building Pittsburgh, Pa.

NAME
COMPANY
ADDRESS

Correct Lubrication in Action...

Hydraulic Pump



Amos Molded Plastics is one of America's foremost molders and finishers of thermoplastics. They produce a wide variety of parts and products for the radio, television, refrigeration and air-conditioning industries.

Mobil **SOCONY MOBIL**

Leader in lubrication for over 91 years

COMPANY

ADDRESS

in the **Plastics Industry**

Maintenance Cost Cut 44%

One of many maintenance savings achieved for Amos Molded Plastics with the help of Socony Mobil

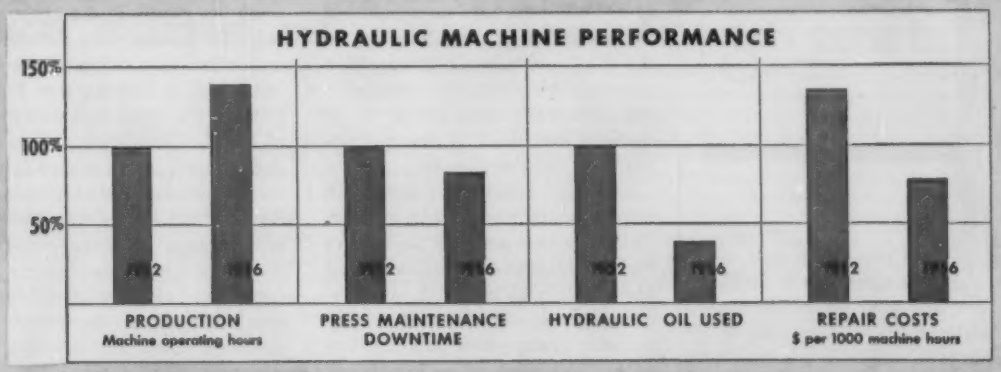
Despite a 37% increase in production hours over a five-year period, Amos Molded Plastics has managed to reduce maintenance and production costs consistently. This leading plastics manufacturer credits Socony Mobil's program of Correct Lubrication with a good share of these savings.

To illustrate: Records show that in 1952 molding machine hydraulic pump repair costs ran $135 per 1000 operating hours. Mobil engineers, working closely with the plant engineer, analyzed maintenance procedures . . . suggested improvements. They helped set up lubrication schedules for each machine . . . recommended the correct Mobil product for all equipment. Today, in spite of higher labor and parts costs, repair expenditures have been cut to $76 per 1000 operating hours . . . a reduction of 44%.

This is Correct Lubrication in Action—the only program that gives you the benefit of 91 years of lubrication knowledge . . . the services of more experienced lubrication engineers . . . top-quality products. It cut costs for Amos Plastics. Why not for you?

How Correct Lubrication Cuts Maintenance Costs

Graph shown here gives an accurate picture of results achieved for Amos Plastics through Mobil Correct Lubrication. Some ways this remarkable record was accomplished are detailed below.



Machine downtime cut — Excessive downtime of molding machines was found to be due to oil leakage and oil contamination. Mobil engineers recommended improved oil seals . . . set up periodic laboratory analyses . . . proposed annual cleaning of hydraulic systems. This cut downtime 17% . . . saved $13,800 over 1952 figures.

Oil consumption cut sharply—Socony Mobil maintenance clinics, conducted for plant's hydraulic engineers, taught them latest methods of reducing leakage. In addition, because Mobil hydraulic oils are of top quality they can be reprocessed and used indefinitely. Result—oil use was reduced 63% . . . $4,600 saved yearly.

These savings and many more helped Amos Molded Plastics increase profits. For information on how Mobil Correct Lubrication can cut costs, improve production, contact your Mobil representative.

Correct Lubrication

A proved program to reduce maintenance costs

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

CHECKLIST

for buyers of

ELECTRONIC HEAT SEALING EQUIPMENT

- ☐ Do you get immediate full production, even with unskilled or new operators, because the units provide safe, simple, comfortable operation?
- ☐ Do you get long life, trouble-free performance because all the components are of the highest quality?
- ☐ Is the construction extra sturdy, really built for day-in-day-out production, with an extra heavy C-frame, big working bed area, and all-steel welded stand?
- ☐ Does the unit have a reserve power feature? Does it take the full size die it's rated for?
- ☐ Does it assure a uniform seal, strong, clean seams, perfect embossing, every time . . . and then some?

—If your answer to all of these questions is "yes", you can only be talking about Sealomatic. One "no" answer means you're not getting your money's worth. Why not write or phone for the facts about Sealomatic Electronic Heat Sealing Equipment—today. There are models from ½ KW to 30KW to meet every requirement, plus special models for applique work, lamp shade work and automatic roll feeding. Thermal units for blister packaging, fast drying of adhesives.

SEALOMATIC
ELECTRONICS CORPORATION
Dept. M, 429 Kent Ave., Bklyn., N. Y.
EVergreen 8-9413
Distributors in All Major Cities

Coloring polyethylene

(*From pp.* 168-172)

effect. However, continued heating or extreme heat may cause a fading or lightening of the color. In some instances, lightening of the color may be due to the sublimation of the colorant at the higher temperatures.

Bleeding colorants

Usually colorants soluble or partially soluble in polyethylene are avoided whenever possible. These colorants will bleed from the colored polyethylene article into any other polyethylene article, colored or uncolored. Moreover, they will discolor practically all printing inks and decorative lacquers applied on the colored article. Bleeding is more pronounced at higher concentrations and at higher temperatures.

Two tests that can be made on a colorant to determine its tendency to bleed are 1) the contact test and 2) the solubility test. In the contact test, the colored polyethylene is pressed against a white polyethylene, both having smooth surfaces, with a pressure of approximately 2½ p.s.i. Storage at 170° F. will tend to accelerate the bleeding of the colorant to the white sample. Colorants with extreme bleeding characteristics are detected within 24 hr., while those of low bleeding characteristics may require months.

In the solubility test, the colorants are stirred into toluene. Colorants that actually dissolve to a clear solution can be discounted immediately as they will also dissolve in polyethylene and readily transfer to any other polyethylene with which they come in contact. These colorants are practically all oil-soluble. However, there are a few organic toners included in this group which are to be avoided.

The more difficult bleeders to detect are those with partial solubility in toluene and polyethylene. In toluene, these colorants will present an opaque appearance after stirring. However, if allowed to stand for a period of time, most will show a supernatant colored liquid, indicating their partial solubility. An alternative to settling is to insert a strip of filter paper into the colorant dispersion with 4 to 5 in. of paper above the surface of the liquid. If the colorant is in solution, a colored or dark colored area will appear 2 to 3 in. above the surface of the liquid within a few minutes. The darkness of this area will be proportional to the bleeding characteristics of the colorant.

Colorant exudation

This is the migration of a colorant from a sample to its surface where it remains in a powder or free form. Exudation is associated with the solubility or partial solubility of the colorants. Some oil-soluble dyes and organic pigments show this effect within a few hours of fabrication while others require storage of weeks before traces of exudation are discernible. A few partially soluble organic pigments show only a trace of exudation after 1 yr. and others show no trace at all.

The simplest means for detecting exudation of a colorant is by wiping the surface of the colored sample with a smooth white cloth or tissue. The dry colorant can be observed on the contact area of the white material and the color is said to crock. To maintain properly the pressure for determining exudation, a crockmeter may be employed, following test Method 8-45 of the American Association of Textile Chemists and Colorants.

Obviously, the exuded colorant would present a hazardous condition from all points of view. It would wipe off onto everything it brushed against, including the hands and clothing, and bleeding would tend to be more pronounced since the colorant is in a concentrated form.

Resistance to sunlight

Colorants stable on exposure to sunlight may be required for certain applications. The colorants suitable for general applications are listed in Table I, p. 168.

Types of coloring agents

The textile dyes familiar to most people are usually soluble in water, and insoluble in materials such as toluene, benzene, acetone, and other organic solvents. It follows that they are insoluble in polyethylene and

Let one dependable source

(of Plasticizers)

solve some of your problems, too!

Quite a few plastics processors find that they can make shrewd use of ADM's versatile line of plasticizers. Not that these folks necessarily buy *all* our plasticizers or only *our* plasticizers . . . although we think it's great if they want to do either.

But ADM's line of polymeric and epoxy plasticizers does lend itself admirably to smart buying. For one thing, we're probably shipping into your market on a daily or almost daily basis right now. With products for industry ranging from paint vehicles and resins, through fatty acids and higher fatty alcohols, to core oils and other large-volume materials, it's a rare market we miss. That means many more chances for you to profit by full carload and truckload freight rates on l.c.l. purchases.

Also, inventories can be kept to mighty lean proportions when you make most of your products from a few versatile plasticizers. That simplifies production and ties up less storage space.

Just in case your memory needs refreshing, ADM boasts of four top-notch epoxy and two polymeric vinyl plasticizers. The former are Admex 710 (both a plasticizer and stabilizer), Admex 711 (tops in resistance to migration and exudation), Admex 744 (for best performance at temperature extremes), and Admex 745 (the low temperature plasticizer with low volatility and extraction features). The polymeric plasticizers are Admex 760 (pale color and highest permanence and non-migration) and Admex 761 (low viscosity with excellent extraction resistance).

We hope the coupon below will entice you into learning more about our wares. Why not use it and discover (a) how fast we answer our mail and (b) how the ADM complete plasticizer line can cut your inventories and freight costs, solve some of your production problems, and add a bit to your profits.

Admex
Vinyl Plasticizers

Archer-Daniels-Midland

Archer QUALITY

OTHER ADM PRODUCTS: Linseed, Soybean and Marine Oils, Paint Vehicles, Synthetic and Natural Resins, Fatty Acids and Alcohols, Vinyl Plasticizers, Hydrogenated Glycerides, Sperm Oil, Foundry Binders, Industrial Cereal, Vegetable Proteins, Wheat Flour, Dehydrated Alfalfa, Livestock and Poultry Feeds.

Archer-Daniels-Midland Company
731 Investors Building, Minneapolis 2, Minnesota

Please send information on

☐ Admex 710 ☐ Admex 745
☐ Admex 711 ☐ Admex 760
☐ Admex 744 ☐ Admex 761

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

designed for the plastics - rubber industries

Xaloy

bimetallic extruder cylinders

Increase production—cut costs.

Xaloy and Xaloy 306 are supplied as standard, original and replacement parts by all leading extruder manufacturers.

WRITE FOR NEW 1956 XALOY ENGINEERING AND DATA GUIDE

Xaloy

INDUSTRIAL RESEARCH LABORATORIES
DIVISION OF HONOLULU OIL CORPORATION
961 East Slauson Avenue • Los Angeles 11, California

since they have no tinctorial value in a dispersed form, they are unsuitable for coloring polyethylene. Occasionally, a lake of one of the water-soluble dyes may be used as a pigment under controlled processing and exposure conditions.

The oil-soluble dyes, being soluble in toluene, are soluble in polyethylene. They definitely bleed into polyethylene and all exude to a greater or lesser degree and cannot be considered as polyethylene colorants.

Organic pigments, including some pigmentized vat dyes, may be considered with due regard for their bleeding, exudation, and stability characteristics.

Inorganic pigments constitute the largest group of colorants suitable for polyethylene.

Table I lists those colorants of general value as "A. General Use" and those of limited but useful value as "B. Limited Use."

Spectral characteristics

Choosing colorants with respect to their spectral characteristics can frequently extend the life of polyethylene products. It has been observed that polyethylene filaments woven into a fabric and exposed to light, contracted and tore even though protected from ultra-violet light and weathering by glass. In this case, black was the worst offender, although other colors were involved to a lesser degree. Obviously, the cause of this condition was overheating of the colored filaments. Choosing pigments that reflect most of the infra-red light would lessen this undesirable condition. In addition, weathering of polyethylene products may be improved if colorants are chosen that absorb in the ultra-violet range.

Table II, p. 170, shows the approximate absorption in the intra-red and ultra-violet portions of the spectrum of many of the colorants recommended for polyethylene.

Electrical properties

The effects of colorants upon the power factor and dielectric constant of polyethylene are shown in Table III, p. 172. As can be seen, the concentration of colorants in the polyethylene is

Your fast way of pre-determining the weathering qualities of a Plastic is in the ATLAS WEATHER-OMETER®

Test for resistance to sunlight, moisture, and thermal shock.
Results are accurate and reliable and can be reproduced precisely over and over again. The Weather-Ometer furnishes a yard stick to measure the improved quality of a plastic in development and to maintain a standard of quality in production.
Automatic control of light, moisture, and temperature, can be set for repeating cycles according to the test program selected. A year of destructive weathering can be reduced to a few weeks of testing in the Weather-Ometer.

For Color Fastness only — use the Atlas Fade-Ometer®. Fully automatic in operation.

Write for technical information and recommendations for your particular problem.

ATLAS ELECTRIC DEVICES CO., 4114 N. Ravenswood Ave., Chicago 13, Illinois

low. However, they produce colors at 0.1-in. thickness that are translucent to essentially opaque and of good color strength. Lower-gage material will require higher concentrations of colorants to produce proper color and opacity and the electrical characteristics can be expected to be adversely affected. At these low concentrations, most of the colored polyethylene falls within the power factor range of the uncolored polyethylene. Carbon black, as expected, gave a power factor figure almost 10 times the highest figure for the uncolored polyethylene.

The electrical resistances of the same colored polyethylene samples were measured on a megohm bridge. The bridge allows measurements of resistances up to 1,000,000 megohms. None of the 18 disks measured showed resistances under 1,000,000 megohms. Some variance can be expected with higher concentration of pigments.

Conclusion

There are obvious advantages to be gained by consumer coloring of polyethylene. These include reduction in inventory, control of the colors produced, and in some cases a probable reduction in cost. Furthermore, when a color file has been firmly established from color matching trials, it may be found that colors are matched quickly and colored products produced in the shortest possible time. However, these advantages must not outweigh the necessity of maintaining quality. Products to be exposed to weather must have maximum dispersion of colorants. Slipshod coloring, obvious to the average user of polyethylene products, can lead only to a distrust of plastic products and a decided loss instead of gain.

References

1. W. A. Goodwin, "Coloring Polyethylene," MODERN PLASTICS, *31*, 104 (Aug. 1950).

2. V. T. Walder, W. J. Clarke, J. B. DeCoste, and J. B. Howard, "Weathering Studies on Polyethylene: Wire and Cable Applications," Ind. Eng. Chem. *42*, 2320 (Nov. 1950).—END

WOLOCH
for
PLASTICS

We Buy and Sell

VIRGIN
AND
REPROCESSED
•
MOLDING
POWDERS

We carry a large inventory of all types of thermoplastic scrap and virgin molding powders.

Polyethelene • Polystyrene • Butyrate
Nylon • Plastisol • Phenolic
Cellulose acetate • Ethyl cellulose
Vinyl • Acrylic • Plasticizers

george
Woloch
CO., INC.

601 West 26th Street
New York 1, N. Y.
ORegon 5-2350

CABLE: GEOWOLOCH New York

OFFICES:
601 West 26th Street
New York 1, New York
ORegon 5-2350

1587 Water Street
Cuyahoga Falls, Ohio
SWansdale 4-5237

WAREHOUSES:
1082 Norita Street
Akron, Ohio

1587 Water Street
Cuyahoga Falls, Ohio

432 First Street
Jersey City, New Jersey

601 West 26th Street
New York, New York

514 West 24th Street
New York, New York

MM

MARKED IMPROVEMENTS in
IDENTIFICATION AND DECORATION

A voice from the shelf... *that says "Here's the paint ...drug...oil...you're looking for..." would certainly help both buyer and seller. Attractively lithographed cans do "talk" this way, but one trouble has been high production runs of lithographed cans vs. the short run needs of variables such as color names, batch numbers and date codes. Markem suggested imprinting the variables on partially lithographed cans, as they are needed, and built the 70AF machine to do the job. Today a fair number are in use, imprinting little 1/32 to full gallon sizes, areas to 2" x 6", at rates up to 1500 an hour (an even faster rotary machine is underway). Beats torn, smudged or missing paper labels all hollow.*

"Elephant trunk" marker... *is not the usual way Markem describes its machines, but for the 89A, the nickname has stuck. This is a typical Markem "Special Products" development, for marking tradename and size on tubular rubber insulation. The inelegant nickname originated because the material is a six foot length of gray tube 1⅛" to 5" in diameter. It is fed into the machine, passes under the printing head and ejected by a lower drive roll. Adjustments for different diameters are easily made, and other useful features include mobility for use in different locations, variable speed motor, excellent imprint quality with Markem's jasmine yellow marking compound. The people who worked out this "Special" perhaps can help you, if you have a yet-unanswered problem in identification/decoration marking.*

"Do-it yourself"... *is often prompted by economy reasons. In marking products, however, the manufacturer who "does it himself" not only saves money, but also gets what he wants when he wants it. Here's what we mean: a company making plastic cases for eyeglass lens cleaner had the product name and directions imprinted on the containers by a job printer. The method was neither convenient or economical. The local Markem man presented a case for the 20A machine, and it gave a good account of itself in an 80-prints-per-minute run. Having another satisfied customer makes us happy, and he's tickled with the quality, convenience, and prospect of the 20A paying for itself in six months.*

Is there a shape, surface or size giving you trouble in efficient marking? Try the Markem Method—a source of better marking for 46 years. Write Markem Machine Co., Keene 20, N.H.

MARKEM

The Plastiscope

News and interpretations of the news
By R. L. Van Boskirk

Section 2 (*Section 1 starts on p. 37*)

National Distillers takes a big bite into chemicals industry

Observers in the plastics industry woke up one morning about three years ago to discover to their surprise that a big liquor company was going to make a big splash by jumping into the polyethylene pool, which since then has given signs of becoming a polyethylene ocean. But whether it be in pool or ocean, the ripples from that splash have been coming faster and getting bigger.

The liquor company was National Distillers Products Corp. which had previously acquired U. S. Industrial Corp. and then established a 60% owned subsidiary, National Petro-Chemicals Corp., with a manufacturing plant at Tuscola, Ill., to produce polyethylene and other chemicals. In 1956, National's chemical operations produced 34% of the firm's profits compared with 12% in 1955, even though the beverage division also produced increased sales and profits. Result: the owners of National are changing their company name to National Distillers and Chemical Corp.

Top profit item. The company's polyethylene plant at Tuscola, which began operations under an I.C.I. license with a 26 million-lb. capacity, was increased to 50 million in 1956 and will be up to 100 million by the end of 1957, which will make National's capacity third largest in the world, at least until Phillips is operating at its proposed 110 million-lb. capacity rate. At the present time, polyethylene is claimed to be one of U.S.I.'s top profit items.

All National (or U.S.I. as it is generally called in the trade) production will be by the high-pressure process with facilities for producing resin in densities ranging from 0.918 to 0.950. Resins made by the low-pressure process generally range from 0.940 to 0.970.

The company is now marketing a 0.924-density resin for film-grade use that has exceptionally good clarity but by no means recommends it over the conventional 0.918 film grade, unless clarity is mandatory; the lower-density material has better stress crack resistance. Company technicians think movement to the 0.920, 0.924, and higher-density materials should be slow and cautious until its worth is well proven.

Another new chemical to be produced at Tuscola is U.S.I. ISO-SEBACIC acid which is of considerable interest to the plasticizer industry. It will be manufactured at a new plant scheduled for completion late this year. Sebacics are valuable for improving low-temperature flexibility of vinyl chloride products, but their previous high cost has been a deterrent toward more widespread use.

Yearly growth shown. National Distillers sales in 1956 were $543 million compared with $500 million in 1955 and $395 million in 1947. Every year has shown a growth. Net income was $20 million in 1956 compared with $15 million in 1955. In 1947 net income was $36 million. The Chemical Div. of National spent $24 million in capital expenditures in 1956 and expects 1957 expenditures to reach a total of approximately $31 million.

In addition to the Beverage Div., the other divisions or associates are U.S.I., National Petro-Chemicals at Tuscola, Metalectro Corp., Laurel, Md., and Reactive Metals, Inc., Ashtabula, Ohio.

U.S.I., acquired by National in 1951, is a 50-year-old company, was a pioneer in development of surface coatings from natural gums and rosins, and is now sales agent for all National's chemicals, except LPG (liquefied gases) and ethyl chloride which are made at Tuscola. Principal chemicals made and sold by U.S.I. are ethyl alcohol and related solvents, metallic sodium, chlorine, caustic soda, phosphoric acid, sulfuric acid, and ammonia. In addition, it sells synthetic industrial alcohol and polyethylene produced by National Petro-Chemicals and three new products: isosebacic acid from Tuscola and zirconium and titanium metal produced by Reactive Metals, Inc. at Ashtabula, Ohio. Reactive Metals is a joint enterprise with Mallory-Sharon.

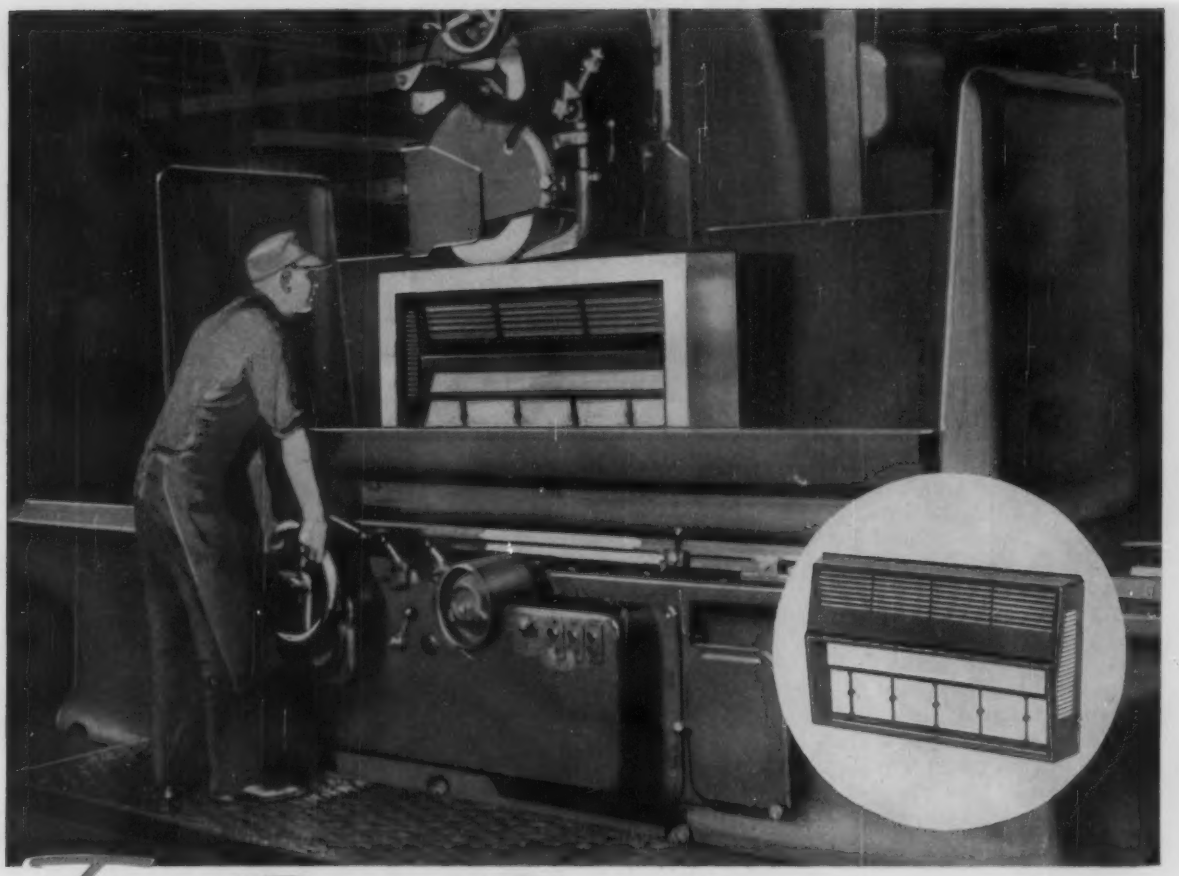
Research activities are huge and various. The company's Cincinnati research laboratories, plus Tuscola laboratory facilities, are constantly at work on polyethylene and allied polymer research as well as other projects. Metalectro Corp. is doing laboratory and pilot plant work in chemical fuels for rocket and jet engines. Also, the company has joined nine other corporations in the organization of Industrial Reactor Laboratories, Inc. which is constructing a nuclear research reactor in Plainsboro, N. J.

Promising intermediate

Methallyl chloride is now commercially available from Food Machinery & Chemical Corp.'s recently formed FMC Organic Chemicals Div. and is expected to find application in the resin and plastics fields, as well as in organic synthesis. The chemical can be self-polymerized or co-polymerized with a wide variety of reactive monomers; its monomer shows enhanced reactivity as co-monomer in free radical polymerization.

The presence of two highly reactive centers in the methallyl

*Reg. U.S. Pat. Off.



For a Better Product

AT LOWER COST... A PERFECT MOLD

At Newark Die Company skilled craftsmen guide modern machines to fashion molds of superior quality . . . a vital step in making a better molded product at lower cost. Here a giant Mattison surface grinder readies a mold for the ornamental grille of an air conditioner. With unerring precision it squares the mold and smooths the parting surface to a flawless finish . . . one of the many steps in the making of a perfect mold. Into this and every stage of mold-making at the Newark Die Company goes a combination of engineering know-how, proud craftsmanship and unsurpassed facilities . . . a combination that has set mold-making standards for more than thirty years.

Write for articles on Solving Big Mold Problems and New Revolutionary Type Injection Molding Machines.

NEWARK DIE COMPANY

22 SCOTT STREET, NEWARK 2, N. J.

Phone: MArket 2-3305

NDCO TRADE MARK

The Plastiscope

chloride molecule suggests many uses for the chloride as an intermediate in organic synthesis. Methallyl chloride polymers are suggested for evaluation in adhesives, protective coatings, molding powders, castings, laminates, safety glass liners, specialty rubbers, etc.

New bond for Mylar

A new process for bonding embossed Mylar polyester film to a variety of other rigid and flexible materials, including plastics, pressed wood, steel, aluminum, etc. has been announced by Seiberling Rubber Co., Akron, Ohio. According to the company, what distinguishes this method from others is the use of a thermosetting adhesive, plus a special combination of time, heat, and pressure to get the bond. Sheet metal covered with Mylar by this process can be shaped after the surfacing has been applied.

Anticipated applications include coverings for radio cabinets, air conditioners, refrigerators, and other household appliances; decorated automotive parts; restaurant counters; and others.

New source for petrochemicals

Formation of Amoco Chemicals Corp., 910 S. Michigan Ave., Chicago, Ill., has recently been completed. The firm, organized through the consolidation of Pan American Chemicals Corp., Indoil Chemical Co., and Hidalgo Chemical Co., will produce petroleum resins, aromatic solvents, hydrocarbon plasticizers, alcohols, aldehydes, acids, ketones, and other chemicals of interest to the plastics industry. Amoco has manufacturing facilities at Brownsville (aliphatic chemicals) and Texas City (aromatic hydrocarbons), Texas.

Present plans call for emphasis on research for new products for the plastics, paint, rubber, and chemical industries. The first major development project will be a plant in the midwest to produce aromatic acids from petroleum products by a new hydrocarbon oxidation process, with C. L. Parris as manager.

Officers of the new company are as follows: Jay H. Forrester, president; John J. O'Connell, vice president-marketing; Dr. John W. Bertetti, vice president-manufacturing; and Russell L. Brown, secretary. Dr. George A. Harrington is general manager of development; Larry L. Smith, manager of Amoco's plant at Brownsville; Jerald D. Reed, manager of the Texas City plant; Howard R. Peterson, industrial chemicals manager; and Maurice H. Arveson, technical service manager.

Sales offices are maintained in New York, Boston, and Akron.

Two-faced monomer

A new chemical building block, glycidyl methacrylate, is being offered in experimental and pilot plant quantities by the Du Pont Finishes Div. as a convenient way of introducing epoxide groups into vinyl polymers or, conversely, vinyl groups into condensation polymers.

Designated GMA, the monomer will polymerize thermally, with ultra-violet light, or with the usual free radical or ionic polymerization catalysts. Thus, copolymers may be made containing any desired amount of functional groups by varying the proportion of GMA in the monomer charge. Development price is $5 a pound.

Anti-hesive surfacing

Teflon-impregnated glass fabric, produced by Du Pont under the tradename Armalon, is now available with a pressure-sensitive adhesive backing from General Plastics Corp., 165 Third Ave., Paterson, N. J. Previously, companies that wanted to give equipment an anti-hesive surface through the use of Teflon, would often have to send the equipment to the coater, with consequent down-time. With the new cloth, anti-hesive surfaces can be easily and quickly produced.

The new Teflon cloth is available in thicknesses of from 3 to 14 mils and is said to outperform Teflon coatings. The adhesive used is claimed to withstand continuous service at 300° F. The cloth comes 38 in. wide and also in tape widths; 13- by 17-in. laminates in thicknesses to customers' specifications are also available. Applications include slides, chutes, rails, and similar equipment.

How to overcome obsolescence

Overcoming competitive deficiencies of older injection machines was the subject of a talk by A. R. Morse, president of Injection Molders Supply Co., before the Rochester Section of Society of Plastics Engineers, Inc.

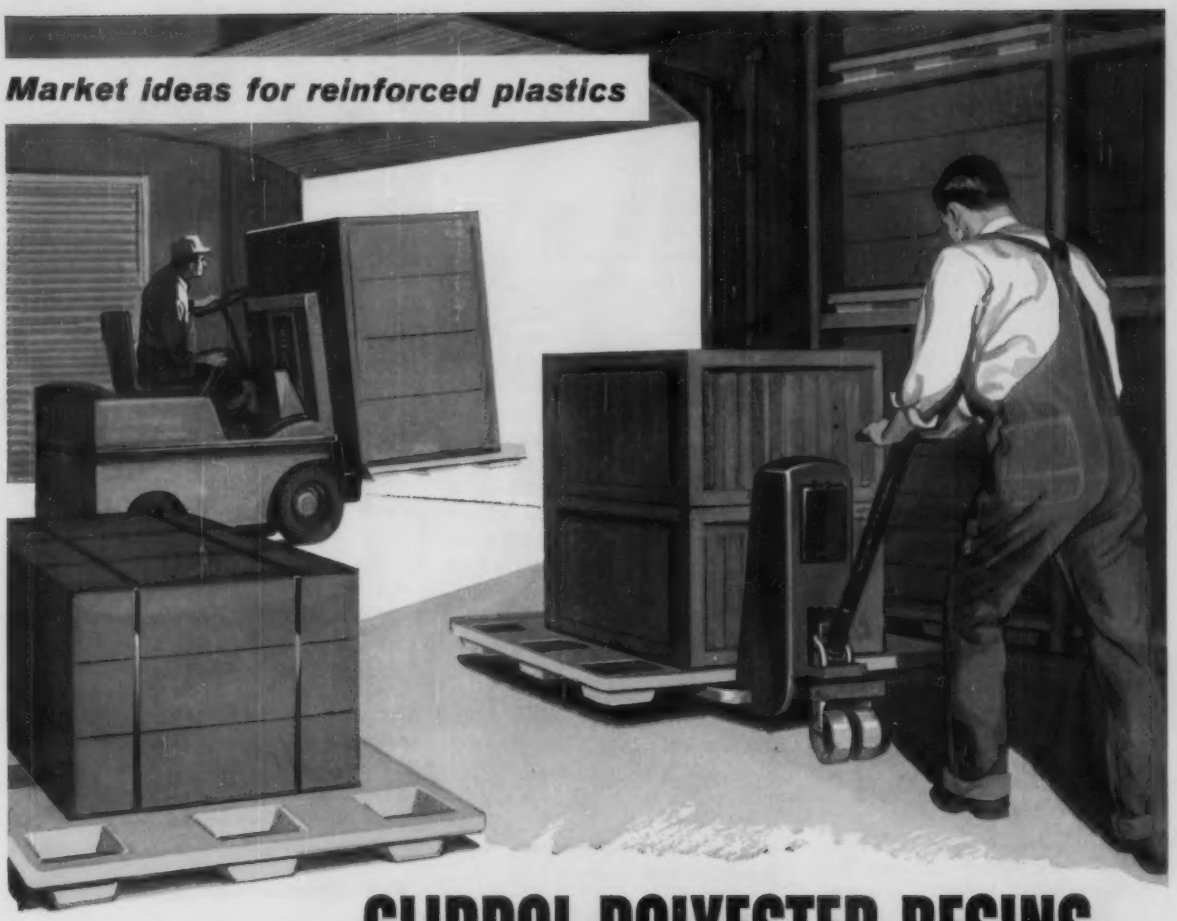
Problems posed by variations in molding materials were discussed, and the development of special purpose heating chambers to meet the demands of modern moldings was reviewed. Also covered was the design of uniform heating chambers adaptable to all makes and models of injection machines, as disclosed by a recently issued patent under which Injection Molders Supply Co. operates on an exclusive license.

Copies of this address may be obtained from Mr. Morse at Injection Molders Supply Co., 3514 Lee Rd., Cleveland, Ohio.

Investment casters grow

Five new companies have been elected to membership in the Investment Casting Institute, 27 E. Monroe St., Chicago, Ill. Companies and their official Institute representatives are: L. Sonneborn Sons, Inc., New York, N. Y., Henry Levkoff; Gray Syracuse, Inc., Manlius, N. Y., R. E. Gray; Hitchiner Mfg. Co., Inc., Milford, N. H., J. H. Morison; F-R Machine Works, Woodside, N. Y., S. Brotman; and Electronicast, Div. of Nilsen Mfg. Co., Addison, Ill., P. A. Nilsen.

The Institute is composed of more than 50 producers of precision made parts by the investment casting process. Investment casting (also known as the "lost-wax process") is a casting technique which uses a low-melting-pattern



GLIDPOL POLYESTER RESINS

...for lightweight, durable, one-piece pallets!

You, as a fabricator, may find new markets for your production in these applications.

Manufacturers appreciate the multiple advantages of materials handling pallets made of fibrous glass, reinforced with GLIDPOL* polyester resins. Strong, yet lightweight, their one-piece molded construction requires little maintenance because GLIDPOL-reinforced products won't rust, rot or corrode. Pigmented GEL-KOTE* coatings provide a smooth, splinter-free surface plus permanent, fade-proof colors.

Versatile GLIDPOL and GEL-KOTE resins are also used in the production of luggage, boat hulls, motor-vehicle bodies and hundreds of other items. It will pay you to investigate the application of these Glidden polyester resins in your products. Write for complete information.

*A Glidden Trade-Mark

A request on your company letterhead will bring you a copy of Technical Bulletin MP-457 which fully describes all of the Glidden GLIDPOL resins for casting, laminating, molding and coating.

GLIDPOL
POLYESTER RESINS

QUALITY Glidden PRODUCTS

THE GLIDDEN COMPANY • INDUSTRIAL FINISHES DIVISION • 900 UNION COMMERCE BLDG., CLEVELAND 14, O.
San Francisco • Los Angeles • Chicago (Nubian Division—1855 N. Leclaire Ave.) • Minneapolis • St. Louis • New Orleans • Cleveland • Atlanta • Reading, Canada: Toronto and Montreal

The Plastiscope

around which a bonded-sand or ceramic mold is formed. When the mold, or "investment" has hardened, the pattern is melted out, leaving a precisely contoured cavity. Injection molded styrene patterns have been finding increasing use in this process.

Sanitized film

Adoption of the Sanitized process in the production of vinyl film at its Jeannette, Pa., plant has been announced by The General Tire & Rubber Co. Incorporation of a special ingredient during the manufacturing operation is claimed to make the vinyl film resistant to germs, odors, and mildew throughout normal usage of the film. The Sanitized film is stated to be non-toxic and non-irritating.

Liner has high chemical resistance

Glass cloth-Kel-F laminate for lining tanks, vessels, reactors, drums, pails, etc., and for surfacing laboratory bench tops, floors in chemical plants, conveyor belts, resin casting forms, rolls, and decks exposed to extreme corrosive conditions is being offered by The United States Gasket Co., a Div. of The Garlock Packing Co., Camden, N. J.

The lining material is stated to have high chemical resistance to acids (including nitric and hydrofluoric), alkalies, oxidants, and most solvents. The glass cloth is impregnated through half its thickness, and the glass backing furnishes the bonding surface.

Built-in metal mesh panels

Fibrous glass-reinforced plastics panels featuring embedded aluminum or steel diamond mesh have been announced by Resolite Corp., Zelienople, Pa. The metal-reinforced translucent panels offer unusual architectural design possibilities as well as semi-transparent protection against flying particles and liquid spray. They may also be used for protective skylights, windows, and other fenestrations.

Designated Security Junior, the new panels have high impact resistance because of the metal mesh reinforcement. In aluminum, the panels consist of 0.081-gage expanded aluminum embedded in flat Resolite sheets using 1½-oz. fibrous glass mat. In steel, the panels consist of 16- to 18-gage expanded steel embedded in similar sheets. They have light transmission values ranging from 71% (clear) to 15% (coral). The average light transmission value is 50 percent.

Colorants for foams

Aqueous colorant dispersions are being offered by Kentucky Color & Chemical Co., Louisville, Ky. Several are high-strength colorants which, according to the company, have been found very suitable in three-component polyurethane foam systems.

Epoxy adhesive for nylon

Epoxy-based Bonding Agent R-323, designed to bond nylon to itself, to metal, or to other materials, and claimed to have high bond and peel strength, has been introduced by Carl H. Biggs Co., 2255 Barry Ave., W. Los Angeles, Calif.

Repeat performance

Flushed with the success of its first contest-promotion stunt of last year (see "Free trip via plastics," MODERN PLASTICS 33, 236, August 1956), The Pantasote Co., New York, N. Y., is again sponsoring a similar competition this year. First prize will be a KLM round-trip flight to Europe for two, plus $250 for expenses; other cash prizes are also offered. Purpose of the campaign is to popularize the name "Pantasote Premium" and to sell more film.

The company makes light-gage polyvinyl chloride film (0.0002 to 0.020 in.) and vinyl-coated fabrics, using resins produced by The Eleonora Chemical Corp., a wholly owned subsidiary. Eleonora came on stream in the fall of 1956 and has a capacity stated to be in excess of 12 million lb. annually.

Pantasote, for the first time since 1951, showed a modest profit in 1956; production was up 6% over 1955 and part of that rise is attributed to the interest generated by the first contest. Company spokesmen anticipate further improvements in 1957 and are looking for a 10 to 15% increase in the firm's film business.

Colorants for high-density polyethylene

Special Formacolor LP dispersions for injection molding and Unicolor LP dispersions for extrusion of linear polyethylene have been developed by Westchester Plastics, Inc., Mamaroneck, N. Y. Because of the wetting characteristics of linear polyethylene, generally used dry colorants have a tendency to form agglomerates. Westchester mixes the colorant in a linear polyethylene base to form masterbatches which can then be extended by the molder or extruder.

New polyester for urethane

Commercial quantities of a new polyester for the production of flexible urethane foam are now available from Witco Chemical Co., 122 E. 42nd St., New York, N. Y. Designated Fomrez 50, the polyester has a narrow hydroxyl number range which contributes to batch-to-batch uniformity and results in reproducible foam.

The company claims that a urethane foam using Fomrez 50 as the polyester portion of the formulation will show minimum deterioration and low compression set when exposed to accelerated humidity aging. Price is 51½¢ a lb. in tank car lots.

New extruders

Quick Industries, Inc., Jackson, Mich., announces the formation of a new division, Quick Plastics, which will specialize in custom extrusion and fabrication of extruded sections. Production is reported to have already started in a 10,000-sq. ft. plant located at 1682 Cooper St., Jackson, with initial equipment consisting of

DEPENDABLE DISPERSION!

DRAMATIC COLOR!

MATCHLESS QUALITY!

masterColor COLOR CONCENTRATES

master batch color concentrates for polyethylene, polystyrene, high impact polystyrene, vinyl. Amazing variety! Exciting special effects! Custom colors you never believed possible . . . plus a choice of 8 great standard colors! Never any dusting . . . never any color contamination! MASTER COLOR offers unusual new opportunities and matchless economy for compounders, extruders, film processors, blow molders.

Kromaplast DRY COLORANTS

dry colorants for injection molding and extrusion.

Opens up limitless new possibilities for in-plant coloring of thermoplastic molding compounds! Easy . . . reliable . . . effective! Handsome special colors . . . dramatic special effects! Standard colors that set new standards for clarity and fidelity! Light-fast, heat-resistant, non-bleeding!

Now . . . new economy and exceptional fidelity of color for thermoplastic compounders, extruders, film processors, injection molders! Colors proved in actual use in our own color compounding operations. Complete control from initial pigment development through manufacture of the color concentrates enables us to make MASTER COLOR and KROMAPLAST always uniform . . . always more satisfactory . . . . . always most economical!

WRITE FOR PRICE LIST

AMERICAN MOLDING POWDER AND CHEMICAL CORPORATION

703 BEDFORD AVENUE, BROOKLYN 6, N. Y.

MANUFACTURERS OF AMPACET THERMOPLASTIC MATERIALS **CUSTOM COMPOUNDING** TO YOUR SPECIFICATIONS **WRITE FOR SPECIFICATIONS AND DETAILS**

PHONE: MAIN 5-7450 ■ CABLE: **CHEMPROD BROOKLYN** ■ **CHICAGO OFFICE**: 5850 NO. CLARK ST., CHICAGO, ILL. ■ TEL.: LONG BEACH 1-0419-20

The Plastiscope

two large NRM extruders, variable-speed conveyors, and automatic cut-off saws and shears. Robert Ilfeld is president.

Another entry into the extrusion field is Peterson Plastics, Inc., 74 Main St., Newport, N. H., which will concentrate on the toy field. W. C. Peterson, in the plastics business since 1940, is president. The company expects to employ 30 persons.

Styrofoam price cut

Price reductions ranging from 10 to 15% on standard board forms of Styrofoam expanded polystyrene have been announced by The Dow Chemical Co., Midland, Mich. The board forms are available in 3-, 8-, and 9-ft. lengths and 12- and 16-in. widths. This is the fourth significant price decrease for Styrofoam in the past four years.

Styrofoam, produced by Dow in eight plants in five different locations across the country, is a lightweight, rigid foam commonly employed in the insulation, novelty, floral, buoyancy, and protective packaging fields. Twenty-three Dow distributors supply the material to customers in all parts of the United States and Canada.

S.P.E.'s busy month

At the 13th Annual Technical Conference recently held in St. Louis, the Society of Plastics Engineers, Inc. elected the following national officers: president—Peter Simmons, The Dow Chemical Co.; vice president—Haiman Nathan, Atlas Plastics; secretary—R. K. Gossett, Gossett & Hill; treasurer—Jules W. Lindau III, Southern Plastics Co. and the University of South Carolina.

Plans for the next conference, to be held in Detroit during January 1958, are also progressing. The Detroit Section has formed an executive committee to formulate plans for technical papers, stressing an international approach. Committee members are: Carl Whitlock, general chairman; Jay Kuhn, co-chairman; John Slater, co-chairman; Iver Freeman, secretary; Fred Schwab, treasurer.

Work is in progress on another volume in the Plastics Engineering Series sponsored by S.P.E. (The first volume was "Quality Control for Plastics Engineers.") The present work will deal with processing of thermoplastics and is expected to constitute a fundamental text on the design of thermoplastic processing equipment. The book is being prepared under the editorship of Du Pont's Dr. E. C. Bernhardt.

The Milwaukee Chapter has elected a new slate of officers as follows: president—Kenneth F. Charter, A. O. Smith Corp.; vice president—Thomas R. Hardeman, Hardeman Laminating Co., Inc.; secretary—Charles H. Herrick, Sterling, Inc.; treasurer—W. H. Brueggemann, A. O. Smith Corp.

Controls polyester flow

A thixotropic agent which is claimed to effectively inhibit crawling, sagging, draining, and pigment settling in polyester resins has been announced by The Baker Castor Oil Co., 120 Broadway, New York, N. Y. Called Thixcin E, the new additive is characterized by easy stir-in, with maximum results attained at temperatures of 90 to 110° F.

The company states that as little as 0.2% of Thixcin E imparts a highly thixotropic body to polyesters.

Hose standard proposed

The Commodity Standards Division of the U. S. Department of Commerce has circulated a Recommended Commercial Standard for vinyl chloride garden hose to the industry for written acceptance. The standard was proposed by The Society of the Plastics Industry, Inc. It covers requirements and test methods for burst strength, low-temperature flexibility, water extraction, water flow rate, and couplings; and requirements for appearance, concentricity, and diameters and tolerances for plastics garden hose. A recommended form for declaring compliance is also included.

Copies of the Recommended Commercial Standard for Vinyl Chloride Plastics Garden Hose, TS-5349, may be obtained from F. W. Reynolds, Commodity Standards Div., U. S. Dept. of Commerce, Washington 25, D. C.

Thinner liner available

Unplasticized polyvinyl chloride lining called Fligid, first introduced two years ago by Kaykor Industries, Inc., Yardville, N. J., for the protection of tanks, vessels, and other process equipment against corrosion, is now available in two standard thicknesses: the new Fligid-55 is only 0.055 in. thick. The original Fligid-85 is still available in a thickness of 0.085 inch.

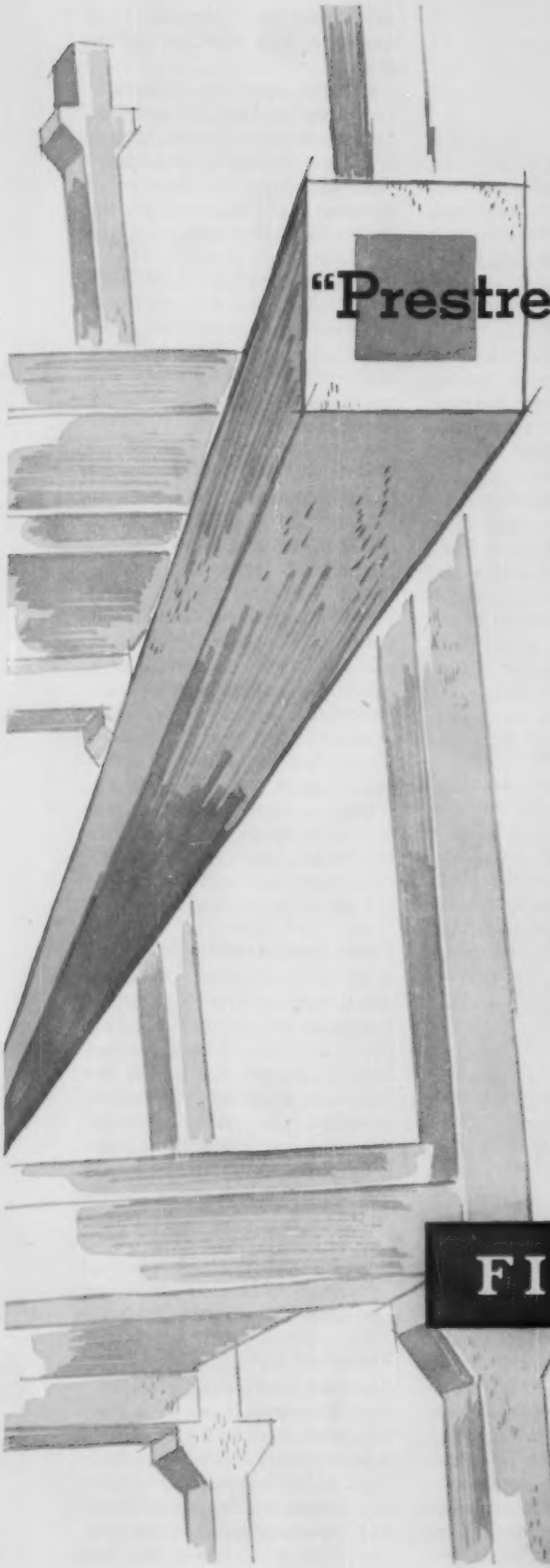
The lining is a continuous laminate of unplasticized PVC on one face and plasticized PVC on the other. Thus, the desirable strength and corrosion resistance of the unplasticized material is combined with the ability of the plasticized polyvinyl chloride to be bonded to such structural materials as steel, concrete, and wood. The laminate does not require curing and can be applied by qualified applicators located throughout the United States and Canada.

Shirts wrapped in polyethylene

Laundered shirts or sweaters can be wrapped in polyethylene covers made from rolls of film by means of a new automatic bagging machine produced by Mehl Mfg. Co., a Div. of Sydney-Thomas Corp., 2057 Reading Rd., Cincinnati, Ohio. According to the company, appreciable savings in both labor and materials are made possible for the dry cleaner and launderer who wants to make his own shirt, sweater, or accessory bags.

The new machine is claimed to package more than 3000 shirts in an 8-hr. day against about 2000 per day for packaging with prefabricated bags. It can produce packages to desired widths and up to 20 in. in length.

According to Bakelite, producer of polyethylene film, the wrap permits inspection of the laun-



"Prestressed" Strength

...building an ever-bigger potential for injection molding

Just as prestressed beams launched a new era in construction, so has *reinforced* FIBERFIL created a completely new concept in injection molding practices throughout industry.

Glass, instead of steel, gives to FIBERFIL Nylon G and FIBERFIL Styrene G the exceptional tensile strength demanded for many products and components — makes these unique injection molding compounds ideal for countless applications that could not be handled successfully with non-reinforced plastics.

Structural strength is but one of a host of FIBERFIL qualities that you should know about . . . chemical, physical, and electrical properties never before offered in such molding compounds . . . all of which are covered in a completely descriptive folder that is yours for the asking. Write for your personal copy *now*.

FIBERFIL

FIBERFIL, INC.
FOX FARM ROAD
WARSAW, IND.

Reinforced Insurance
For All Injection Molding!

The Plastiscope

dered item while protecting it from dust and dirt during delivery.

The bagging machine costs $650, takes up about 27½ by 47 in. of floor space, and weighs about 185 pounds. A tube of polyethylene film on a large roller is fed through an electric heat-sealing unit which closes both ends of the tube around a shirt or sweater. No skilled operator is required.

Cellular plastics standards

Committee D-20 on Plastics of the American Society for Testing Materials has organized Subcommittee XX on Cellular Plastics. The Subcommittee has formed a section to develop test methods and other sections to develop specifications for polyurethane, polyvinyl chloride, polystyrene, and polyethylene cellular plastics.

I. T. Stoneback, Federal Telecommunications Laboratories, Nutley, N. J., is chairman and Betty Lou Raskin, Johns Hopkins University Radiation Laboratory, is secretary.

Soft film for infants

A highly plasticized, yet strong and durable vinyl film, is being produced at The General Tire & Rubber Co.'s Jeannette, Pa., plant for use in juvenile and baby items or wherever an extra soft material is required.

Designated Super-Soft, the 3-gage material can be produced in any color.

Radiation facility

Practical commercial use of atomic radiation to produce plastics and chemicals, and to preserve foods and sterilize drugs moved a step closer with the announcement by Radiation Applications, Inc. of the opening of its Industrial Radiation Center at 42-40 Crescent St., Long Island City, N. Y. The center is claimed to contain the first privately owned cobalt-60 source of radiation in this area regularly available to industry for commercial research and development. In addition, experimental research and development projects will be performed directly by the RAI technical staff.

Laminators organized

Plastics companies that fabricate high-pressure decorative laminates have joined to form the National Association of Plastics Fabricators, Engineers Bldg., Cleveland, Ohio.

Officers of the association are: president—H. Snyder, Sani-Top; vice president—I. J. Pierson, Riverside Plastics; secretary — H. Koppelman, Fabritex, Inc.; executive secretary—Arthur J. Toscany; and directors—A. L. Blair, Ed Brown, J. Clark, and Abe Havesen.

High-pressure decorative laminates

Sales of decorative laminates have grown from $1.2 million in 1945 to nearly $80 million in 1956, according to U. S. Plywood Corp. Volume may rise to $120 million by 1962, says the same source. In 1956, it was estimated that 40% of the laminates were channeled into furniture; 23% for counter tops and bathroom vanities; 22% for store fixtures; 7% for do-it-yourself markets; and the remainder for walls, ceilings, and transportation. The furniture field is perhaps the most important future potential for growth. The advent of bending grades to eliminate sharp edges and corners has added and will continue to add considerably to increased volume for decorative laminates.

Now makes rigid containers

Start of production of rigid molded polyethylene containers for the refrigeration and freezer field has been announced by Safeway Products Div., Yorkville Paper Co., 431 E. 77th St., New York, N. Y. The company's freezer packaging line includes polyethylene bags, Arctic freezer paper, Zero foil, and Zero wrap cellophane; entry into the rigid container field rounds out the line.

Initially, the firm will mold containers in 1-pt., 1½-pt., and 1-qt. sizes, using its own formulation compounded of virgin polyethylene from a variety of sources. Wall thickness of the containers is 0.055 in., and the company claims that they have a high degree of translucency. Distribution will be through hardware jobbers, paper jobbers, grocery chains, etc., under the Safelon and Arctic brand labels. Retail price is $1.59 per container regardless of size.

Primer for plastisols

Clear primer 69X-1406, said to provide good plastisol adhesion to metal, has been developed by the research laboratory of The Stanley Chemical Co., a subsidiary of The Stanley Works, East Berlin, Conn. The primer is effective whether baked or air-dried. It is transparent and colorless and recommended for use under clear plastisol or for other applications where a colored primer would be objectionable.

Colored variations of the new primer are also available as 67X-832 (white, for improved water resistance) and 66X-5457 (yellow, for corrosion resistance).

Stock bottles available

A stock line of polyethylene bottles is now offered by Precision Extruders Div., Lamex Chemical Corp. The line includes seven basic shapes—Boston round, oblong, oval, prism cylinder, tapered round, straight cylinder, and rigid high-temperature wide mouth. Recommended uses include cosmetics, toiletries, or pharmaceuticals.

Mass production is reported to have become possible with the recent move of Lamex into larger quarters in Manchester, N. H.

Germ-free toys

Introduction of a line of Corobex-treated polyethylene toys has been announced by Payton Products, Inc., 200 Fifth Ave., New York, N. Y. Corobex, a product of Bex Industries, Inc., New York, N. Y., is a bacteriostatic compound (see MODERN PLASTICS, *34*, 310,

October 1956) used in making molded plastics, textiles, and other products germproof. Corobex is also said to make products treated with it permanently self-deodorizing, mold-static, and fungus-static.

Payton states that incorporation of Corobex will not result in a price increase in its line.

Regional diversification

Fully one third of the United States plastics output is fabricated in New England, according to a survey conducted by Boni, Watkins, Jason & Co., Inc. Purpose of the survey was to show that New England is more than making up for its industrial losses in textiles and shoes by attracting new industries, particularly chemicals and electronics. In Massachusetts alone, the report shows that capital expenditures for all industry in 1956 were 21% above 1955 and some firms plan 40% greater expenditure in 1957.

Massachusetts has sometimes been called the cradle of injection molding, and there is still a heavy concentration of molders in that area.

In addition to plastics fabricating, New England is also particularly prominent in the manufacture of plastics processing equipment, such as presses, extruders, calenders, and molds and is well dotted with raw materials producers. In addition to such old-timers as Monsanto, Naugatuck, General Electric, Synco, the Wallingford Cyanamid plant, and others, there are Borden, Foster Grant, Great American Plastics, Thompson, Solar, and, lately, Seamless Rubber, a division of United Drug, which has announced a new styrene polymerization plant.

New England is also a heavy consumer of vinyl chloride resins for calendering and wire coating. Indeed, the area from Boston to Philadelphia is thought to consume over half of all the vinyl chloride sold in the United States. There are many analysts who believe that this Boston to Philadelphia area is by far the largest consumer of all plastics in the United States.

The next largest consumer of plastics materials is the so-called Chicago area, although the Detroit-Ohio area may also claim that honor. The Pacific Coast is thought to consume between 10 and 15%, and usage there is claimed to be growing more rapidly than in other areas. The plywood, housewares, and packaging industries are large consumers in the Golden West.

The Gulf Coast is growing rapidly as a raw material center, but consumption of resins in that area is still relatively small.

Puerto Rico now claims 39 U. S. plastics manufacturing plants doing an annual production of over $5 million. However, average earnings of workers there are given as 64¢ compared with $1.80 in the United States, with productivity ranging between 80 and 100% of that of U. S. workers. Plastics items shipped to the United States in 1955 included atomizers, phonograph records, Pliofilm, polyethylene bags, sprayers, tableware, toys, and vaporizers. Several raw material companies now maintain large warehouses on the island.

I.D.I. competition launched

The 7th Annual Design Award Program of the Industrial Designers' Institute is under way. The awards are determined on the basis of the designers' contributions to the field, the manufacturer, and the ultimate consumer through the study of mass-produced products submitted on behalf of a specific designer or design team.

Results of the competition will be announced in June. Submission of designers' work may be made up to May 5, 1957, on forms available from Walter C. Granville, 38 S. Dearborn St., Chicago, Ill.

Nylon washers from stock

Molybdenum disulfide-filled nylon thrust washers, designated Nylatron GS, are now available from stock in a range of sizes from The Polymer Corp. of Pennsylvania, Reading, Pa. The washers are stamped from strip to outside diameters of ⅜ to 1 5/16 in. and inside diameters of ⅛ to 1 in. and come in thicknesses of 1/64, 1/32, and 1/16 inch. They are used where good wear resistance under light thrust conditions is required, e.g., in fractional horsepower motors where they demonstrate long life in contact with metals.

According to Polymer, the filled nylon formulation has better dimensional stability and lower deformation under load than standard nylon, coupled with a lower coefficient of friction and higher wear resistance in many uses.

Reinforced plastics awards

The Executive Committee Awards of the Reinforced Plastics Div. of The Society of the Plastics Industry, Inc. went this year to three West Coast members: John S. Berkson, president of Alsynite Co. of America; Harold B. Freeman, West Coast regional sales manager, Plastics and Resins Div., American Cyanamid Co.; and W. Brandt Goldsworthy, consultant, Redondo Beach, Calif. The presentations were made by James S. Lunn, president of Lunn Laminates, Inc.

These awards are given in recognition of outstanding services to the plastics industry and no more than three awards are made in any one year. The recipients must receive the unanimous approval of the entire committee.

Triple-textured vinyl

Tri-Tex, a triple-textured, valley printed vinyl fabric is now being marketed exclusively by Middletown Rubber Corp., Middletown, Conn. The newly developed Tri-Tex method is used in deeply embossed valley prints on plastics whereby the "slopes" as well as the "valleys" are given a controlled ink deposit; this results in an unusual 3-D decorative effect.

The Venetian Flounce pattern is the start of a series of print/embossing patterns to be presented. The initial showing was at the Allied Shoe Show in New York City.

To use plastics tools

A program to familiarize its employees with the possibilities of plastics tools and their use in its manufacturing processes has been instituted by Arvin Industries, Inc., Columbus, Ind. The company produces automobile mufflers and parts, radios, portable electric heaters and fans, auto

The Plastiscope

heaters, outdoor furniture, ironing boards, and other articles. According to Arvin, the program differs from those established by other manufacturers in that it is aimed at eventually giving nearly complete autonomy in the matter of plastics tooling to managers, superintendents, and toolrooms of individual plants.

Included in the program is a nine-week course for a number of Arvin toolmakers in the production of plastics tools. In addition, plant superintendents and foremen are attending classes during two general sessions which are devoted to plastics toolmaking theory and history. This group will form the nucleus of a training force that will introduce the technique to each plant.

Improved laminate

A cold-punching laminate, Insurok XT-896, claimed to have low moisture absorption, low dielectric loss at high frequencies, and good insulation resistance, has been announced by The Richardson Co., Melrose Park, Ill. An XXXP laminate, XT-896, is stated to punch clean at room temperature.

In copper-clad form, the material is reported to have high bond strength and good blister resistance. Applications include mechanical assemblies and printed circuitry.

Prefoamed epoxy blocks

A method of producing foamed epoxy blocks, called DuRafoam, in sizes up to 1 by 2 by 6 ft., has been developed by D & R Pilot Plants, Inc., Hazardville, Conn. DuRafoam comes in densities ranging from 5 lb./cu. ft. to 20 lb./cu. foot. In the heavier densities, it is said to be very hard, strong, and impermeable to water.

The blocks are used in constructing templets, checking fixtures, and models. It is reported that blocks can be machined and finished to a greater accuracy than that obtainable with the best hardwood and will hold their dimensions because they are unaffected by humidity. The foamed epoxy is a thermoset, is unaffected by solvents, and has the temperature resistance expected of cured epoxy resin. The structure is essentially unicellular and, therefore, the material lends itself well to flotation applications. Cost of the material ranges from $2.48 per lb. for the 20-lb./cu. ft. density blocks to $6.36 per lb. for the 5-lb./cu. ft. density blocks.

Plasticizer news

Nonyl alcohol for plasticizers. Commercial quantities of nonyl alcohol and dinonyl phthalate have now been available from Eastman Chemical Products, Inc., Kingsport, Tenn., for several months and have stirred up considerable interest in the trade. Nonyl alcohol is the first 9-carbon alcohol to be produced in this country in quantity. It is the forerunner of several derivatives of higher aliphatic aldehydes which Eastman expects to introduce in the near future.

Initial evaluation of the new nonyl alcohol included its reaction with phthalic anhydride to form dinonyl phthalate. The uniformity and low color of the alcohol results in excellent reaction characteristics with dibasic acids with little color developing during esterification. It is expected that the alcohol will find its principal market among manufacturers of plasticizers.

The dinonyl phthalate which is being introduced appears to possess several advantages over dioctyl phthalate, according to Eastman. Principal among these advantages is its greater retention in vinyl formulations, superior electrical properties, and its economy. Tests indicate that vinyl formulations of equal modulus of elasticity require approximately 14% more dinonyl phthalate than do formulations based on dioctyl phthalate. Since the vinyl polymer is more costly than the plasticizer, appreciable savings are possible.

Processes better. A new high-molecular-weight polymeric plasticizer, 3049-S, is being introduced by Emery Industries, Inc., Cincinnati, Ohio. The light-colored product is said to overcome processing difficulties often encountered in high-molecular-weight plasticizers and permits use of conventional equipment. Other properties claimed for 3049-S include low migration, resistance to extraction, low volatility, and good electrical characteristics. According to Emery, the viscosity and wetting characteristics of 3049-S make it an excellent plasticizer for dispersion and pigment grinding.

New primary. PX-313, a new modified alkyl phthalate primary plasticizer, has been developed and placed on the market by the Industrial Chemicals Div. of Pittsburgh Coke & Chemical Co., Pittsburgh 22, Pa. The plasticizer is stated to impart low-temperature flexibility to vinyls equivalent to that obtained with normal octyl-normal decyl phthalates, but its cost is appreciably lower. It is recommended by the company for use in high-quality coated fabrics, sheeting, and film; vinyl jacket wire and other extruded products; and in plastisols.

Pipe notes

Koroseal pipe for fixing bath. Active hypo and developer solutions used in film processing can be handled like water with rigid Koroseal pipe, valves, and fittings, manufactured by B. F. Goodrich Industrial Products Co., Div. of B. F. Goodrich Co., Akron, Ohio. Pioneer installation is at Consolidated Film Industries' new motion picture processing laboratory in Burbank, Calif.

A network of more than 1600 ft. of Koroseal pipe carries the solutions through the entire system. There is no problem of contamination since the pipe does not react chemically with the solutions,

Swedlow ACQUIRES HONEYCOMB STRUCTURES COMPANY!

Here's NEWS *of importance to you!*

Giving you a reliable source for aluminum honeycomb cores and fabricated parts . . .

Swedlow Plastics Company is pleased to announce the recent acquisition of controlling interest in the assets, engineering and manufacturing facilities, techniques, and patents of Honeycomb Structures Company, Inc. of Los Angeles. Existing facilities will be retained, improved, and expanded.

The addition of honeycomb structural materials to Swedlow's decorative and industrial laminated plastics and heat resistant materials is a natural development and opens new fields for these interesting materials that are being used to an ever expanding degree by industry.

Sale of honeycomb core material will be handled by a newly formed "Core Division", and the sale of fabricated parts by the "Bonded Structures Division" of Swedlow Plastics Company. This now puts the combined engineering services of Swedlow and the former Honeycomb Structures Company at your disposal.

We welcome your inquiry on specific applications for these new materials.

Swedlow aluminum honeycomb material is available in a variety of core designs, sizes & thicknesses for applications such as . . .

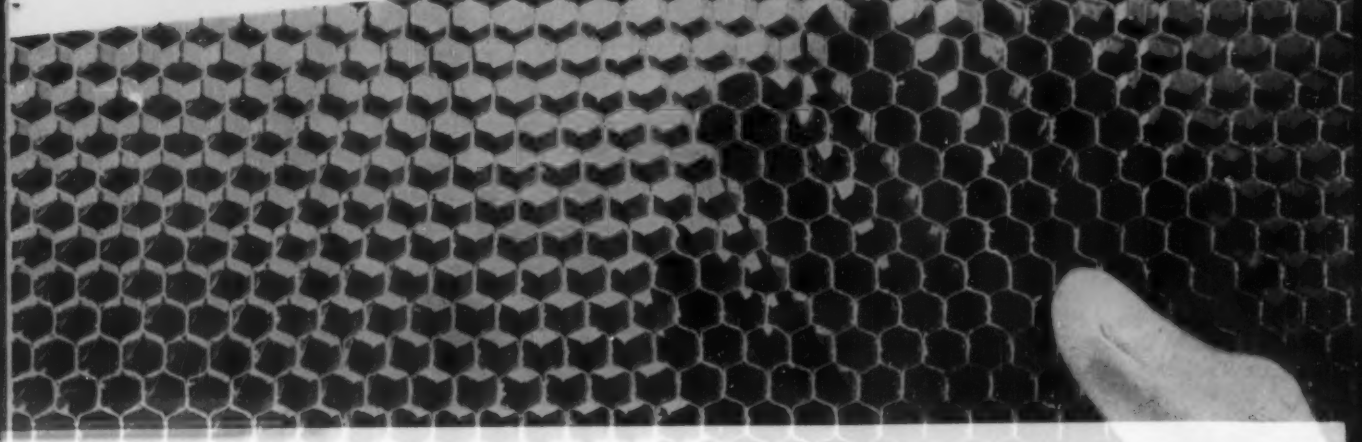
Partition Panelling
Flooring
Stabilizers
Missile Fins
Tow Targets
Tail Assemblies
Ducting
Pressurized Tanks
Radar Vans
Microwave Reflectors
Electronic Gear Housings
Heat Exchangers
etc.

Advantages of honeycomb structural materials

High strength-weight ratio
High rigidity-weight ratio
Good thermal resistance
High fatigue resistance
Good acoustical insulation
High vibration-damping properties

Swedlow PLASTICS COMPANY

Los Angeles, California
Youngstown, Ohio
Please refer to Dept. 15



"BLACKS"

The Plastiscope

according to Goodrich. Pipe diameters throughout the network range from ½ to 1½ in., with 18 Koroseal valves.

Cost of special stainless steel materials needed to handle the solutions is estimated at 10 times that of Koroseal. Koroseal pipe and fittings, weighing 25% less than their metal equivalent, are easier to install and their enduring performance reduces maintenance costs by 50 percent.

Plastic soil pipe. Skyline Plastic Pipe, Inc., Titusville, Pa., has a new plastic soil pipe called Drain-Line. Cement-type fittings are used with the pipe, which is produced in two weights—light-duty and standard—and in sizes from 2- to 6-in. diameters, plain or perforated. The company has not stated what plastic material is used in construction of this pipe.

Skyline also announces plans for the construction of a new 60,000-sq. ft. manufacturing plant adjacent to its present plant. This new factory is part of a $500,000 expansion program the company has planned for 1957, its 15th anniversary year. Production plans call for the manufacture of the new soil pipe in its West Coast plant at Seaside, Calif., and the opening of a new plant in Texas, in either the Dallas or Houston area.

New entry. Newly formed Corroplast, Inc., 625 Park Ave., New York, N. Y., has started operations at its 30,000-sq. ft. Passaic, N. J., plant. The company primarily produces unplasticized PVC pipe, duct, and sheeting for chemical- and corrosion-resistant applications, using a special low-molecular-weight Vipla resin recently developed by Montecatini and marketed in the United States by Chemore Corp., New York, N. Y. Corroplast states that the resin has higher strength properties than earlier available material.

Distribution in the United States and Canada will be through Ryerson & Son, Inc., under the Ryertex Omicron tradename.

Leon Moore is president and W. A. Mollard vice president. Plant manager is Jacob Jaglom.

Documentary. "On the line," a film describing the Polyken protective tape coating method, had its recent premiere performance before Houston members of the Pipeliners' Club. The movie summarizes the installation of a 122-mile, 22-in. lateral gas line between Defiance, Ohio, and Bridgman, Mich., and shows the method by which the tape was applied.

Polyken polyethylene protective coating is supplied by Polyken Sales Div., The Kendall Co., Chicago, Ill.

Expansion

Penn-Plastics Corp., Fairhill Ave., Glenside, Pa., just outside Philadelphia, has expanded during the past year from a firm that specialized in a limited number of large quantity phenolic moldings for a half dozen or so customers to a firm that now produces all kinds of plastics moldings in almost any size, quantity, type, or style desired. The company has over 30 compression and transfer presses, with the necessary preforming, preheating, and normalizing equipment required, and injection machines of from 2- to 20-oz. capacity. The company is prepared to serve its customers from design to engineering, tooling, molding, finishing, and inspection.

Charles W. Kleiderer, formerly of Brilhart Plastics Corp., assumed the vice presidency of Penn-Plastics when the company adopted the policy of expanding beyond its former limited operations.

The Borden Co.'s Chemical Div. has started operations at its new Kent, Wash., formaldehyde plant. The new facility, with an annual production capacity of 36 million lb., is the second one erected by Borden in the West. The firm has a similar operation in Springfield, Ore.

The Kent plant will be the first to use Borden's Karl Fischer process, for which U. S. rights were leased last year from **Apparate und Rohrleitungsban** in West Germany. The process is said to permit a higher yield in formaldehyde production, with lower utility and steam requirements for processing. A 93% yield is anticipated, as compared with the national average of 82 to 88 percent.

The company has been a major producer of formaldehyde for some time. It sells it commercially and also uses it in the manufacture of phenol, urea, and resorcinol resins.

Petroleum Chemicals, Inc. will erect a regional office building at the Lake Charles, La., plant to house about 125 operating and engineering department personnel. The building, expected to be completed in early 1958, is part of an over-all $60 million expansion program. Previously announced were installations for producing ethylene, ethylene oxide, anhydrous ammonia, and butyl rubber.

The two-story structure was designed by the engineering and architectural staff of **Continental Oil Co.**, which owns P.C.I. jointly with **Cities Service.**

Canadian Titanium Pigments, Ltd., a subsidiary of **National Lead Co.**, reports that its new 90,000-sq. ft. titanium pigments plant is 50% completed and that production is scheduled to begin in the third quarter of this year. The plant's entire output of titanium dioxide will go to Canadian industry. The facility, located on a 76-acre site at Varennes, Que., is Canada's first titanium pigment plant and will employ approximately 300 workers.

Rona Laboratories, Inc., Newark, N. J., has started operations at its new plant comprising five buildings in the Constable Hook area of Bayonne, N. J. The company

"BLACKS?"

"TOP QUALITY" says the Lab

"CONSISTENT RESULTS" says Production

"SERVICE AND ECONOMY" says Purchasing

The use of Carbon Blacks for pigmenting plastics is a familiar story to Witco-Continental. A wide range of special purpose blacks, coupled with experienced technical service, can contribute to easing your plastic pigmenting problems.

Write for assistance in your pigmenting problems.

CARBON BLACKS

Witcoblak® No. 11—regular color channel
Witcoblak No. 32—maximum jetness at low cost
Witcoblak No. 50—good color, flow and tinting strength
Witcoblak No. 100—jetter color. Nigrometer 74
Witcoblak Hitone—jet black. Nigrometer 71

WITCO

37 Years of Growth

WITCO CHEMICAL COMPANY
CONTINENTAL CARBON COMPANY

122 East 42nd Street, New York 17, N.Y.

Chicago • Boston • Akron • Atlanta • Houston
Los Angeles • San Francisco
London and Manchester, England

CHEMICAL PROGRESS WEEK APRIL 9-15

World Wide Sales Offices of AMCEL and PAN AMCEL for Plastic and Resin Products of

Celanese
CORPORATION OF AMERICA

Argentina, Buenos Aires.....Importadora Técnica "ITA" S.R.L.
Australia, Sydney, N.S.W. James Hardie Trading Co. (Pty.) Ltd.
Australia, Melbourne.....Hardie Trading Co. Ltd.
Austria, Vienna XIX.....Eugen Farber
Belgium, Brussels.....Keyser & MacKay†
Brazil, Sao Paulo.....*Brasimet" Comercio e Industria S.A.
Canada, Montreal, P.Q.....*Canadian Chemical Co., Ltd.
Canada, Toronto, Ont.....*Canadian Chemical Co., Ltd.
Canada, Vancouver, B.C.....*Canadian Chemical Co., Ltd.
Chile, Santiago.....M. Hochschild y Cia. Ltda.
Colombia, Cali.....*Celanese Colombiana S.A.
Costa Rica, San Jose.....Servicios Técnicos
Cuba, Havana.....Lainz y Compañia
Denmark, Copenhagen.....A/S Industriprodukter
Ecuador, Quito.....Schiller & Cia.
France, Paris.....Loiret and Haentjens††
Guatemala, Guatemala City.....Enrique Bauer Arzu
Holland, The Hague.....Handelsmaatschappij Vos & Co.††
Hong Kong.....Optorg Co. (Malaya) Ltd.
Indonesia, Djakarta-Kota.....Messers N. V. Agung
Israel, Tel-Aviv.....E. Huppert
Italy, Milano.....Usvicoff†
Japan, Tokyo.....Percy Breen††
Japan, Tokyo.....A. R. Brown, McFarlane and Co., Ltd.†
Korea, Seoul.....Bando Trading Co
Malaya, Kuala Lumpur.....Getz Bros. & Co.
Malaya, Singapore.....Getz Bros. & Co.
Mexico, Mexico D.F.....*Celanese Mexicana, S.A.
New Zealand, Auckland.....Hardie Trading Co., Ltd.
Paraguay (offices in Montevideo, Uruguay) Armando Bachman Suc.
Peru, Lima.....George Checkley
Philippines, Manila.....Union Trade Distributors
El Salvador, San Salvador.....Charles F. Rich & Co.
So. Africa, Johannesburg.....J. J. Allmann Sales Corp.
Switzerland, Basle.....Chemische Fabrik Schweizerhall
Taiwan (Formosa), Taipei.....Dah Chung Trading Co.
Uruguay, Montevideo.....Armando Bachman Suc.
Venezuela, Caracas.....*Celanese Venezolana, S.A.
Vietnam So., Saigon (& Laos).....Getz Bros. & Co. (Vietnam)

*Affiliated Companies—Celanese Corporation of America
†Polyester Resins only
††Plastics only

Amcel and Pan Amcel offer these plastic products of Celanese Corporation of America

Cast and Extruded Acetate Film and Sheet
Cellulose Acetate Molding Compounds
Polyvinyl Acetate Emulsions
Cellulose Propionate Molding Compound
Polyester Resins

AMCEL CO., INC. and PAN AMCEL CO., INC.
180 Madison Ave., New York 16
Affiliates of Celanese Corporation of America

For latest Celanese Plastics Information see ad on page 9.

The Plastiscope

manufactures natural and synthetic pearl pigments and operates additional plants in Maine, New Jersey, and Canada.

George E. Meyers and **Robert Blanc**, formerly with Mearl Corp., have been appointed technical sales representatives. Mr. Meyers will cover New York and New Jersey, and Mr. Blanc New England.

Aerojet-General Corp., subsidiary of **The General Tire & Rubber Co.**, announces plans for the construction of a new 28,000-sq. ft. building in Azusa, Calif., for its Structural Plastics Dept. The single-story structure will include provisions for possible future expansion. Aerojet makes reinforced plastics pressure vessels and other products.

Scranton Lace Co., Scranton, Pa., has acquired **Southwest International Corp.**, a Delaware corporation, in a move to diversify its operations and products.

Southwest's manufacturing interests include fibrous glass-reinforced plastics, diesel engines, precision gages, and cement tile. Scranton manufactures vinyl laminates for upholstery, outdoor umbrellas, truck covers, swimming pool liners and covers, and other end uses; vinyl shower curtains; and table covers, draperies, and curtains.

G. Felsenthal & Sons, Inc., Chicago, Ill., injection molder and fabricator, has remodeled its light-intensity testing laboratory as part of a $250,000 plant expansion and improvement program. The laboratory is used to test edge-lighted aircraft panels and is stated by the company to be the only lab in the midwest approved by the U. S. Bureau of Standards to perform such tests.

National Adhesives, Ltd., English affiliate of **National Starch Products, Inc.**, New York, N. Y., is erecting a polymerization plant in Slough, England. Plans call for the production of polymers of vinyl acetate for use in the packaging, paper, textile, coating, and paint industries. Facilities will also be provided for the production of formulated resin adhesives. Included in the construction is the erection of a new laboratory to house development, service, and control facilities.

Upon completion of the polymerization unit, a new adhesives manufacturing plant and office building will be constructed to replace the present units.

National Starch operates polymerization plants in Plainfield, N. J., and Meredosia, Ill.

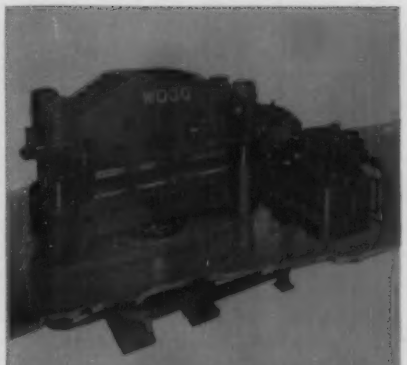
The Texas Co. has completed facilities at Port Arthur, Texas, for the production of di-isobutylene used in the manufacture of plastics, plasticizers, and other chemical products. Initial capacity will be 8 million lb. annually; however, provision for further expansion has been incorporated.

Plastics Color Co., 233 Broad St., Summit, N. J., has broken ground for a new plant to be located in the same general area as the present facility. The new building will reportedly double the size of the present production and laboratory space. The company produces inorganic and luminescent pigments, color dispersions, dry colorants, dyes, and emulsifying agents.

Testing Machines, Inc., 123 W. 64th St., New York, N. Y., has acquired the testing machine division of National Forge & Ordnance Co. and now offers a full line of equipment to the plastics industry, including impact testers and extensometers.

Plastics Process Co. announces the construction of a new 60,000-sq. ft. plant on a 3-acre site at 11200 Hindry, Los Angeles, Calif. The company does specialty extrusion work, including nylon, and has laboratory extrusion equipment for experimental development work.

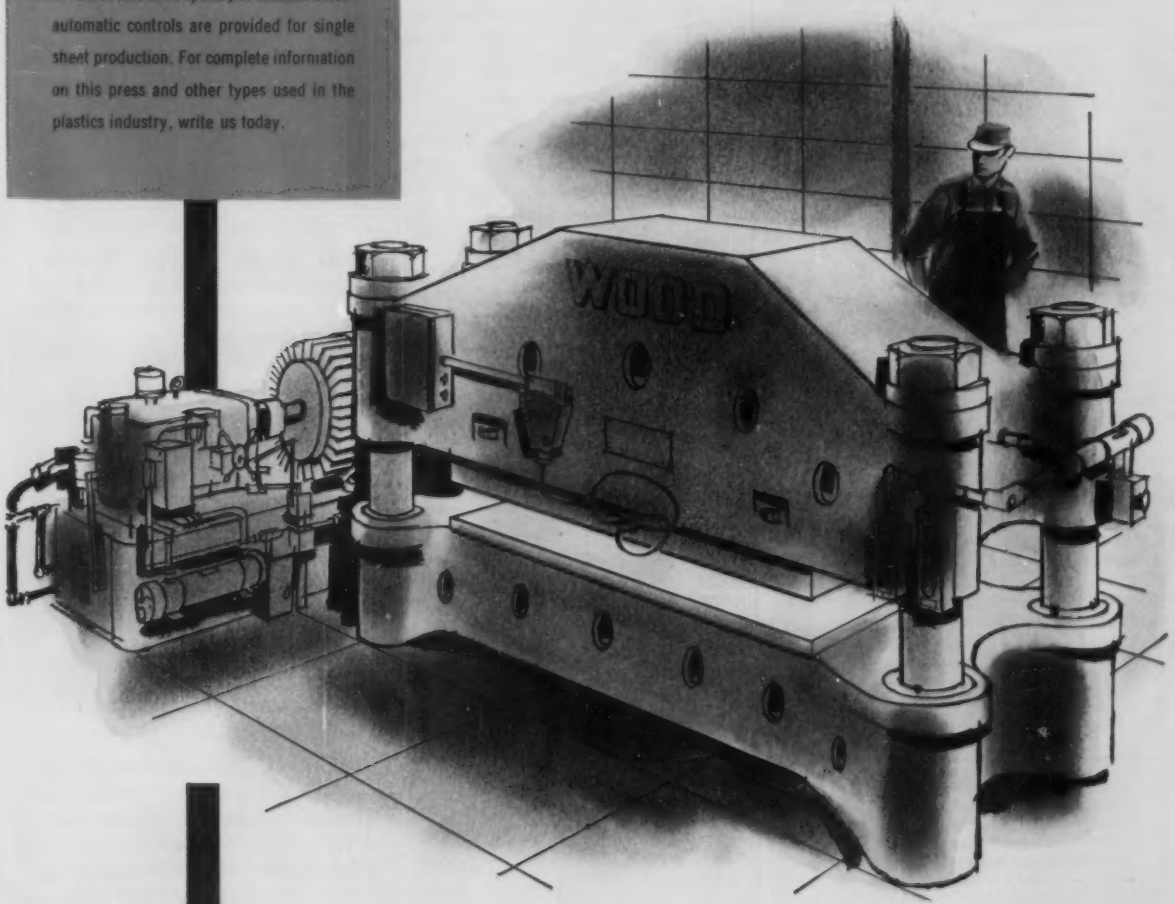
Plastic Materials, Inc. has moved from Westbury, N. Y., to a new and larger plant at New South Rd., Hicksville, N. Y. The firm does compounding of virgin ther-



Single Opening 500-ton Embossing Press for use on leather and plastic products. Fully automatic operation with suitable feeding mechanism permits pressing of sheets at rate of 12 cycles per minute. Semi-automatic controls are provided for single sheet production. For complete information on this press and other types used in the plastics industry, write us today.

Success is seldom accidental

People and products do stumble into success. But not often. The success of R. D. Wood Presses, for example, stems from unremitting attention to details. Every R. D. Wood Press is the product of sound design, carefully chosen materials, conscientious workmanship. This is why R. D. Wood Presses consistently deliver the utmost in smooth, dependable performance; fast, economical production; and trouble-free operation. And this is why so many leading press-users specify R. D. Wood.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

Does your Product Require

RIGID PLASTIC SHEETS?

- **corrugated**
- **reinforced**
- **laminated**
- **transparent**
- **press polished**
- **translucent**
- **embossed**
- **opaque**

High & low impact P.V.C.
Sizes to 51" x 108"

CORRUGATED
For architectural construction, displays and decorative trim

LAMINATED
Including decorative materials like Fiberglas, wire screen, fabric, paper and many others. Widely used for lampshades

HIGH COMPRESSION
Up to 50" wide and 72" long, of phenolic, silicone or esters

REINFORCED
Built-up sheets of unusual strength and thickness. Up to 3½" thick in polyethylene

PRESS POLISHED
Smooth flaw-free surfaces. Good optical properties when transparent

EMBOSSED
A variety of interesting colors and effects

CLARITY
Transparent, translucent and opaque
COLORS ON REQUEST

SHEETS and ROLLS IN STOCK

Vinylite	acetate
polyethylene	Plexiglas
modified styrene	butyrate
high & low impact P.V.C.	

No matter how unusual your specifications may be . . . we meet them precisely. Let us know what your requirements are.

SCRANTON PLASTIC LAMINATING CORP.
3218 PITTSTON AVENUE
SCRANTON 6, PENNSYLVANIA

moplastics (cellulose acetate, polystyrene, polyethylene, and acrylics) in all standard and special colors. Among the latter are pearlescents, tinsels, phosphorescents, and metallics. Compounds are available from stock and to special order.

Swedlow Plastics Co., Los Angeles, Calif., and Youngstown, Ohio, has acquired a controlling interest in **Honeycomb Structures Co., Inc.**, Los Angeles, including engineering and manufacturing facilities, techniques, and patents.

Sale of honeycomb core raw material will be handled by a newly established Core Div. of Swedlow; sale of fabricated honeycomb parts by the Bonded Structures Div. Other Swedlow products include decorative and industrial laminates and heat-reflective types.

Smooth-On Mfg. Co. announces that construction is under way at its Jersey City, N. J., plant which will more than double existing research facilities. Smooth-On, producer of iron cements for over 60 years, has recently intensified research and development efforts in the epoxy resin and flexible plastics fields.

The Stanley Chemical Co., a subsidiary of **The Stanley Works**, East Berlin, Conn., announces the opening of an injection molding dept., featuring the latest equipment for this type of manufacturing. The new department will do custom injection molding of all types.

S. I. Jacobson Mfg. Co. has increased its facilities at 1414 S. Wabash Ave., Chicago, Ill., from 16,000 to 27,000 sq. feet. The firm produces merchandising and display containers for hard lines, made of vinyl-coated cloth, supported and unsupported plastics, canvas, etc.

Deceased

Marcel F. Bachner, 65, president of Chicago Molded Products Corp., Chicago, Ill., died on February 21 following a brief illness. Formerly a toolmaker by trade, Mr. Bachner in 1919 became one of the founders of Chicago Molded and was active in company management until his death.

Harry H. Kugel, 60, president of Nosco Plastics, Inc., Erie, Pa., died on February 11.

Meetings

Plastics group

June 14: Society of Plastics Engineers, Inc., Regional Technical Conference, Lowell Institute of Technology, Lowell, Mass. Subject: "Plastics for Electronics."

Other meetings

April 8-11: American Management Association, Twenty-sixth National Packaging Exposition, International Amphitheatre, Chicago, Ill.

April 10-12: Point of Purchase Advertising Institute, Eleventh Annual Symposium and Exhibit, Palmer House, Chicago, Ill.

May 13-14: Commercial Chemical Development Association, Annual Resort Meeting, French Lick, Ind.

May 14-16: Armour Research Foundation of Illinois Institute of Technology and *Nucleonics* Magazine, Second Annual Industrial Nuclear Technology Conference, Museum of Science and Industry, Chicago, Ill.

June 6: Manufacturing Chemists' Association, Inc., Annual Meeting, White Sulphur Springs, W. Va.

June 9-12: American Institute of Chemical Engineers, Meeting, Olympic Hotel, Seattle, Wash.

June 16-21: American Society for Testing Materials, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

July 7-11: Independence Housewares Exhibit, Inc., Ninth National Independent Housewares and Home Accessories Exhibit, Convention Hall, Atlantic City, N. J.

July 10-20: International British Plastics Exhibition, Grand and National Halls, Olympia, London, England. Additional information may be obtained from John L. Wood, British Plastics Exhibition, Dorset House, Stamford St., London, S.E.1, England.

Companies . . . People

The Borden Co., Chemical Div.: Monomer - Polymer Laboratories transferred from Leominster, Mass., to 5000 Langdon St., Philadelphia, Pa. Included in the new facilities are research, development, and production laboratories for the custom preparation of specialty monomers and polymers. A pilot plant is being installed for the initial production of new products in drum quantities. The labs are directed by **Dr. K. C. Tsou.** They produce made-to-order catalysts and accelerators; cross-linking agents; monomers for polyelectrolytes; substituted ethylenimines; allyl and diallyl esters; acrylates and methacrylates; and vinyl esters. **James A. Wold,** named general manager of the newly created Consumer Products Dept., will be in charge of new product development and promotion of the existing line of consumer products, including polyvinyl acetate adhesives; Elmer's Contact Cements and solvents; Casco casein glue; and others. **Charles W. Bayley, Jr.** and **Austin I. Weber,** research and development chemists, have been added to the staff of the Coatings and Adhesives Dept. Mr. Bayley will specialize on latex and Mr. Weber on coatings. **Philip E. Coyle, Jr.** named technical sales representative for the eastern and New England territories. **Walter J. Roider, Jr.,** with the division since 1946, named general manager of the Casein Dept., succeeding **Harry D. Wilson,** a director and a vice president of the division and head of the department, who has resigned. Mr. Wilson will continue as a director of the division's Mexican operation, **Casco Quimica de Mexico.**

The Goodyear Tire & Rubber Co., Inc.: R. B. Warren, with the company since 1939, promoted to general manager of the Industrial Products Div., succeeding **Sam DuPree,** now vice president of the company. **O. A. Schilling** appointed sales manager; **H. R. Comstock,** assistant sales manager; **R. E. Chapman,** manager, Central Region; and **R. E. Mercer,** manager of hose sales. **William A. Perry, Jr.,** formerly with the Films and Flooring Div., appointed to packaging films staff.

Goodyear's Chemical Div. field offices in Boston and Cleveland in new locations as follows: Boston—66 B St., Needham Heights, Mass. **John Hussey** is district manager; **Hal Allick** and **Joe Donahue,** field representatives. Cleveland—Goodyear's new distribution center at 18901 Five Points Rd., Brook Park, Ohio. **Roy Wallace** is district manager; **Paul Koons, Rex Draman,** and **Ray McCurdy,** field representatives.

Spencer Chemical Co.: Frank Pyle, formerly works manager of the company's polyethylene plant at Orange, Texas, elected vice president of plastics and will head up the firm's Plastics Div., including production, sales, and product development in the polyethylene and nylon fields. **H. R. Dinges,** previously general manager of Industrial Chemical Sales, elected vice president of industrial chemicals and will be in charge of an integrated product division responsible for the industrial chemical and commercial product segments of the company's business. **Dr. John R. Brown, Jr.,** formerly managing director of research and development, elected vice president of research and development.

Union Carbide—Bakelite Co.: P. W. Wood named central zone manager for the Molding Materials Div., with headquarters in Chicago, Ill.; he will be in charge of molding materials

(*To page* 266)

MOLD COST FOR THIS PART?

Actual Size

Nothing!

Performance: SUPERIOR

Price: CHEAPER

SAVINGS effected by converting from bronze to Nylon paid for the mold of this spherical bushing.

Formerly it was a 5-step machining operation at a unit cost of .575 cents. It is now made in one operation. In 1000 lots each part costs .255 cents. *Savings on the initial order paid for the mold.*

LET US QUOTE ON YOUR SHORT-RUN PLASTIC MOLDINGS. WE WILL SUBMIT QUOTATIONS WITHOUT OBLIGATION.

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS, 7K, MINNESOTA

"INDUSOL"

LIQUID VINYL PLASTISOLS

A NEW Liquid Plastic That Will Modernize Your Product has been developed in our laboratories. These quality vinyl plastisols sell at exceptionally reasonable prices and we custom tailor to meet rigid requirements in many fields.

Paper and Fabric Coating, Rotational and Slush Molding, Vinyl Foam Compounds, Clay Pipe Joints, Gaskets, Plastic Boot, Rubber footwear compounds, Cloth printing, and flocking adhesive are a few of the many applications. Write now for further information.

INDUSTRIAL SOLVENTS & CHEMICALS, INC.

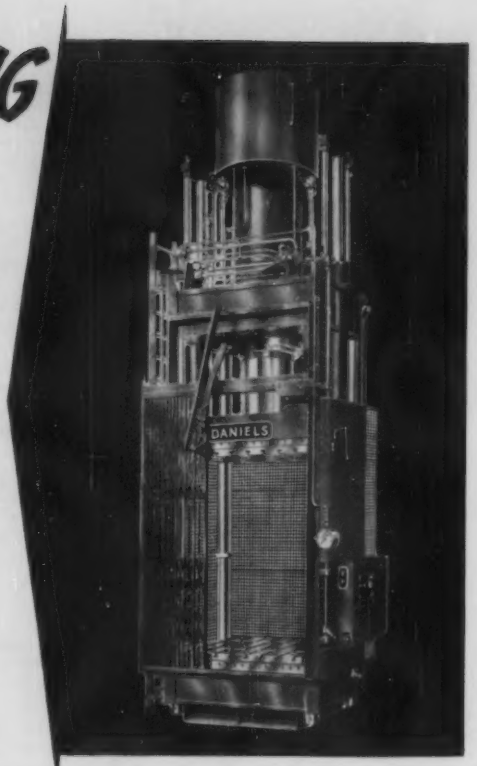
WILKINSONVILLE, MASSACHUSETTS

POLYESTER MOULDING

with this

100 TON LOW PRESSURE PRESS

This is the first Press designed and produced in Great Britain for moulding reinforced Plastics materials. It is much larger than the conventional compression moulding press, having tables 4 ft. x 3 ft., a maximum daylight of 7 ft. and a 4 ft. stroke. To prevent heat from the moulds affecting the press, both the fixed and moving tables are drilled for cooling water. Hydraulic working pressure is 1000 lbs. per sq. in., giving a maximum moulding pressure of 100 tons, but the moulding pressure may be set at any figure between 10 and 100 tons. A slowing device is incorporated which can be set to operate at any portion of the stroke allowing for very slow final closing on the moulded article. The press is a self-contained unit with single stage vane-type pump, 12½ h.p. motor, hydraulic piping and valves.



Other Manufactures:
Transfer Presses
Hobbing Presses

T.H.&J. DANIELS LTD.

Side-Ram Presses
Tabletting Machines
Plainers

T. H. & J. DANIELS LTD.
STROUD • GLOUCESTERSHIRE • ENGLAND

PLASTIC MARKING

Stamp Names, Trademarks, etc. right in your own shop with the *Precision Built* Kingsley Machine

Simple, easy to use. No skilled operators necessary.

Write us about your marking requirements. Send a sample or dimensions of parts to be stamped. We'll reply air mail with complete details on how a Kingsley Machine can be applied to your specific problem.

UP TO 1000 STAMPINGS PER HOUR

Uniform, clean-cut impressions in gold or any color.

KINGSLEY STAMPING MACHINE CO.
HOLLYWOOD

---

plastics scrap...

We pay top prices for all types of plastics scrap and surplus virgin materials. Turn yours into cash.

CUSTOM COMPOUNDING TO YOUR SPECIFICATION

AMERICAN MOLDING POWDER AND CHEMICAL CORPORATION

SUCCESSOR TO

A. BAMBERGER CORPORATION

703 BEDFORD AVE. • BROOKLYN 6, N.Y.

Processors of Plastics Materials

Resin of the future!

PLEOGEN-1810

A special thixotropic polyester tailored for boat builders and for those who cover hulls . . .

Acclaimed by boat builders for production EASE and STRENGTH!

MOL-REZ makes it!

Send for sample and technical data today!

DRUMS • TANKWAGONS • TANKCARS

35 STANDARD POLYESTER RESINS IN STOCK

MOL-REZ DIVISION
American Petrochemical Corporation
Minneapolis 18, Minnesota

LS CUSTOMIZED CARBIDE-TIPPED SAWS MAKE AMAZING SAVINGS

. . . in the sawing of Plexiglass, phenolics, and other materials because each is fitted to YOUR particular production requirements. "Customized" to give you MAXIMUM PRODUCTION, SMOOTHEST CUTS, MAXIMUM TOOL LIFE and a MINIMUM OF DOWN TIME and COSTS. And because we mean what we say,

WRITE FOR FREE CATALOG

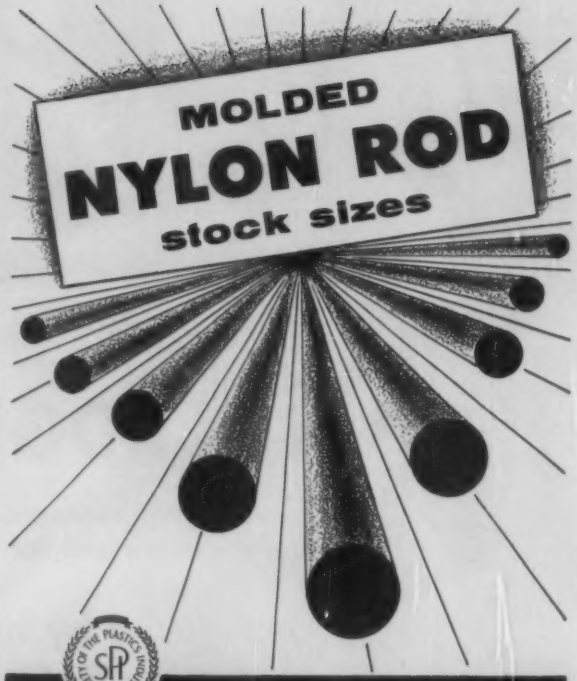
All LS saws are submitted on a fifteen-day free trial basis. Write for Catalog!

LS LEMMON and SNOAP

286 BRIDGE ST., N.W. • GRAND RAPIDS, MICHIGAN

24-hour repair service on all makes and styles of carbide-tipped saws

MOLDED NYLON ROD stock sizes



Member of Plastics Pioneers

A. L. HYDE

GRENLOCH, N. J.

Established 1932

Southern Office: R. L. Carroll • Greenville, S. C.

Companies . . . People

technical representatives working out of the Chicago and St. Louis, Mo., district sales offices. **Dr. E. A. Barr**, with Bakelite since 1941 and formerly assistant director of the Extruded Products Div., now assistant manager of the New Product Engineering Dept.; he will be concerned with the practical application of new plastics and resins developed by the company's laboratories. **R. R. Payne, Jr.**, appointed technical representative in the Hartford, Conn., district sales office, will be responsible for sales and customer service in phenolic, styrene, and polyethylene molding materials.

At the Bound Brook, N.J., plant, **A. W. Korenyi** appointed assistant department head in charge of phenolic molding material quality control activities; **George J. Kuzmak**, assistant department head in the Quality Control Div.; **A. Paul Limbach**, a group leader in charge of the Design Engineering Group; and **Louis L. Carpenter**, assistant director of the Extruded Products Div.

Hercules Powder Co., Inc.: Fred K. Shankweiler, formerly sales manager of coating materials for the Cellulose Products Dept., named director of sales of the department. He succeeds **Werner Brown**, who was recently appointed assistant general manager of the department. **A. R. Olsen** appointed sales manager of the Cellulose and Chemicals Div. of Hercules' Virginia Cellulose Dept. His duties will include liaison between Virginia Cellulose and Cellulose Products Depts. on sales of ethyl cellulose.

United States Rubber Co.—Naugatuck Chemical Div.: George R. Vila has been elected a vice president of the company and appointed general manager of the division; he replaces **John E. Caskey** who has retired after 42 years with the company. Mr. Vila joined the company in 1936 as a salesman in the Rubber Chemicals Dept. In 1952, he was appointed general sales manager, and the following year he was made assistant general manager. **Dr. T. W. Brasfield**, formerly agricultural chemical sales manager, now Los Angeles district manager, replacing **G. L. Dennis** who was transferred to the general sales staff.

G. R. Vila

Footwear and General Products Div.: George H. Callum, with the company for 23 years, appointed general sales manager of manufacturers' products and will be responsible for sales direction of foam cushioning, plastic upholstery, Royalite plastic products, etc. **William J. Mulvey**, with the firm 13 years, succeeds Mr. Callum as sales manager of Naugahyde vinyl-coated fabrics.

Du Pont: Walter H. Salzenberg, formerly assistant general manager of the Grasselli Chemicals Dept., named assistant general manager of the Polychemicals Dept., succeeding **Dr. J. A. Almquist** who has retired. **Dr. Wallace E. Gordon**, director of Du Pont's Advertising Dept., will succeed Mr. Salzenberg in the Grasselli Dept. **Robert H. Pohl** named new director of sales of the Pigments Dept. **Dr. Edwin A. Gee** succeeds Mr. Pohl as assistant director of sales in the Pigments Dept. and **M. James McLain** succeeds Dr. Gee as sales manager for pigment colors. **Ralph C. Krueger** appointed manager of converter sales of the Film Dept., succeeding the late **Edward C. Lake.**

General Electric Co.: John F. Blumenfeld, with the company since 1949, named development engineer at the Chemical Development Dept. **Dr. Roland E. Kreibich** appointed product engineer in the Phenolic Products Section of the Chemical Materials Dept. **George A. Darsie**,

Quality controlled 'deeglas'

in this all-plastic u.d. milk float

This all-plastic milk float, manufactured by Mickleover Transport Ltd. for United Dairies, employs **deeglas** chopped strand mat as its sole reinforcing material.

All **deeglas** products, chopped strand mat, glass rovings and deeformat, are produced under a quality control system based on the requirements of BS.600 and BS.600R. This ensures the consistency so essential for perfect mouldings.

deeglas

Chopped strand mat and deeformat in standard and roof-lighting grades. Glass rovings.

Glass Yarns & Deeside Fabrics Ltd. 44-46 Kingsway, London, W.C.2 Telephone Chancery 7343 and 8257

MIR 8201

NASH NO. 103 FLASH LATHE
Saves Hours of Production Time

NASH

NO. 103 MULTI-SPINDLE ROTARY FINISHER

Finishes Circular Moldings AUTOMATICALLY

In molding circular parts, fixed costs for overhead, materials, time of molding cycle, are encountered. But when it comes to finishing, substantial savings can be made when you perform this operation automatically—with performance-proven NASH equipment.

Choice of 2 Models—Nash No. 103 Continuous, and No. 103-B Intermittent On Turret Rotary Finisher.

Engineering Details and Price Data Sent Promptly Upon Request

SPECIAL FINISHING MACHINES · NASH · SINCE 1890 ·

J. M. NASH *Company*

2370 North Thirtieth Street
MILWAUKEE 10, WISCONSIN

don't let your sales manager be a

"PACKAGING ORPHAN"

In your company he may be called the Sales Manager . . . or the Merchandise Manager . . . or the Distribution Manager; the title isn't important. The chap we're talking about is the one whose interest in the packaging function sometimes may be considered secondary, while the successful completion of his duties depends in a significant measure on the appearance of your company's packages and the protection they give to your products.

If this man, whatever his title may be, doesn't get his own personal copy of Modern Packaging every month to keep him up-to-date, you've a "packaging orphan" on your hands. While he should be, he probably *isn't* up on all the latest techniques of package merchandising, on how to package to obtain sales in multiple units, on what's "hot" in protective and decorative packaging. . . .

Modern Packaging isn't a cure-all for this man, but it will keep him posted on the important packaging developments he ought to know about. A twelve month subscription—including the famous annual Encyclopedia Issue—for him costs only $7.00 in the United States and Canada, $10.00 in Pan America, $20.00 elsewhere. Write today; we'll enter his subscription immediately and bill your company later.

SUBSCRIPTION DEPARTMENT

MODERN PACKAGING

575 Madison Avenue
New York 22, N. Y.

Companies . . . People

with the firm 10 years, designated district sales manager for the Silicone Products Dept. **K. Jerry Morray** appointed manager of the Cleveland sales district of the Silicone Products Dept. **Dr. Bruno Zimm**, physical chemist at the Schenectady research laboratory, has received the Baekeland award of the North Jersey Section, American Chemical Society. Dr. Zimm has made numerous contributions to the high polymer field.

The General Tire & Rubber Co.—Bolta Products: Sumner L. Trilling named general sales manager, succeeding **Daniel E. Hogan, Jr.**, who has resigned to manage his plastics extruding company in North Andover, Mass. **Fred P. Quartarone**, formerly production manager, succeeds Mr. Trilling as sales manager in charge of institutional products. He will supervise the sale of Bolta food service equipment—molded plastic and hard rubber trays, salad bowls, water pitchers, ice tubs, etc. **Frederick H. Dodkin** now assistant to the general manager.

Textileather Div.: Harry Wang named assistant product design manager.

Imperial Chemical Industries, Ltd.: Maldwyn Jones appointed development director and **H. C. Raine** research director of the Plastics Div. **Dr. Laurence M. Smith** named regional sales manager, Plastics Dept., Northern Region Sales. **Dr. R. Beeching** appointed technical director; **Dr. J. Ferguson**, research director; and **C. M. Wright**, development director.

W. R. Grace & Co.—The Cryovac Co. Div.: New district formed, covering southern Ohio, eastern Pennsylvania, and Kentucky, with **E. Vaughn Deal** as district manager, **Donald W. Bretherick**, formerly district sales manager of the Philadelphia district, transferred to Simpsonville, S.C., as assistant to the division's sales manager, responsible for sales administration and sales training. **Ralph J. Garson**, formerly technical sales representative of the Southern Div., succeeds Mr. Bretherick in the Philadelphia post.

National Starch Products, Structural Products Div.: John Meany named eastern field supervisor and **James Elf** midwest field supervisor. The company makes Wood-Lok vinyl emulsion adhesives, Granite-Board particle board, contact cements, epoxy resins, and laminating presses.

Monsanto Chemical Co., Plastics Div.: Kenneth F. Webb, Jr. has joined the Production Dept. at Texas City, Texas. **R. R. Wilson**, formerly New England assistant sales manager, promoted to sales manager for the Detroit district. **Alan L. Lambuth** appointed group leader, Research Dept., at Seattle, Wash. **Karoly Herein** now with Research Dept., at Springfield, Mass., after six years as a chemical technician in Budapest, Hungary.

National Vulcanized Fibre Co.: New district office opened in Dallas, Texas, with **Willard J. Wasson**, formerly sales representative in the Chicago office, as district sales manager. **John J. Morris III** named district manager of the San Francisco sales office, succeeding **Walter M. Gallagher**, appointed district manager in Detroit.

The Carpenter Steel Co.: New and larger mill-branch warehouse in St. Louis, Mo., replacing former warehouse there. **W. J. Stephens** continues as branch manager, **Arthur Hunnius** remains warehouse manager. Sales engineers are **M. L. Duggins, L. G. McNelly**, and **W. I. Potteiger**.

American Viscose Corp.: Clarence L. Harder, formerly in charge of meat casing and secondary bottle closure manufacture at the Fredericksburg, Va., plant, named manager of technical service for Avisco meat casings. **Leslie J. Githens** succeeds Mr. Harder at Fredericksburg.

Haveg Industries, Inc.: John B. Mackenzie, Jr. appointed assistant general sales manager. **Guardian Chemical & Equipment Co., Ltd.**, Montreal, Que., appointed sales representative throughout eastern Canada. The Canadian firm was recently formed expressly to handle Haveg process equipment. **George E. Flemming** is president; **Robert S. Forbes**, vice president and general manager. Guardian will also handle chemicals and equipment for the chemical field.

Archer-Daniels-Midland Co.: Walter G. Andrews, manager of the Resin and Plastics Div. and formerly assistant vice president, elected vice president. **Robert S. Mathews**, manager of the Vinyl Plasticizer Dept., elevated to assistant vice president.

United States Plywood Corp.: Monroe W. Pollack, a vice president since 1945 and previously in charge of special products sales, named director of sales. Mr. Pollack, 54, is the company's oldest full-time employee in length of service (36 years.).

G. Felsenthal & Sons, Inc.: J. Gordon Hoffman, formerly general manager of Bodnar, Inc., now eastern sales representative on edge-lighted aircraft panels made under military specification No. MIL P-7788. **Edward H. Yons**, formerly with Santay

RESINOX 3700

The molding material with higher arc resistance.. assures circuit breaking safety at full load!

High arc resistance determines choice of RESINOX 3700 for new Russell & Stoll circuit breaking receptacles

The new R&S "SAF-T-ARC"® plugs and receptacles provide for complete circuit breaking. Safety is assured, even under overload.

The insulating bodies that house the electrical contacts in these units are molded of RESINOX 3700. Tests conducted by Russell & Stoll for high arc resistance show that RESINOX 3700 did not track or burn, even when subjected to 50% greater than rated loads.

Manufacturers of electrical parts profit also from the excellent moldability of RESINOX 3700, its elimination of scrap and other production problems, its high impact resistance.

RESINOX 3700 has many times been the *one* molding material that can solve an electrical equipment problem. Keep the complete facts about this Monsanto phenolic in your "ready" file. Write to Monsanto Chemical Company, Plastics Division, Room 1762, Springfield 2, Massachusetts.

MONSANTO **RESINOX**

RESINOX: REG. U. S. PAT. OFF.

SAF-T-ARC: REGISTERED TRADE-MARK OF RUSSELL & STOLL COMPANY, INC.

Creative Papers from Mosinee

...are custom-tailored to specific needs...particularly plastic makers'

Paper times a flare to insure safety margins

LAKESIDE RAILWAY FUSEE CO. makes the flares used to warn a train "someone's on the line" ahead. Doing the job well involves considerably more than pouring flammable chemicals into a paper tube. For example, the paper tube itself must burn at a pre-determined rate. Too fast, and there's no receptacle for the chemicals. Too slow, and the paper tube forms a chimney that hides the light of the flare.

Problem — who can develop and make paper that's predictably combustible.

MOSINEE! For 30 years Mosinee has been creating special sulphate papers just to meet such unusual needs. And they may be able to do the same for you. Mail the coupon and see.

Mosinee MOSINEE PAPER MILLS CO. MOSINEE, WIS.

MOSINEE PAPER MILLS CO., Dept. MPL-4, Mosinee, Wisconsin

Please furnish details on how you can create special papers to meet our needs.

NAME.....

FIRM.....

PRODUCT.....

ADDRESS.....

CITY..... ZONE..... STATE.....

Companies... People

Corp., appointed assistant to the president; he will work on problems of production automation. **Hyman Shapiro** now production manager of the Injection Molding Div.

Horizons, Inc.: Princeton, N.J., office consolidated with Cleveland, Ohio, facilities. Previously, administrative activities were carried out in Princeton and research in Cleveland. **K. M. Bartlett,** former executive vice president, elected president to succeed **Edwin T. Goodridge,** resigned. The company is a process and materials research organization.

L.O.F. Glass Fibers Co.: J. Walter Whitacre, Jr. named field representative for the southeastern region at the Jacksonville, Fla., office. **James A. Dennis** appointed to the Manufacturing Div. on special assignments.

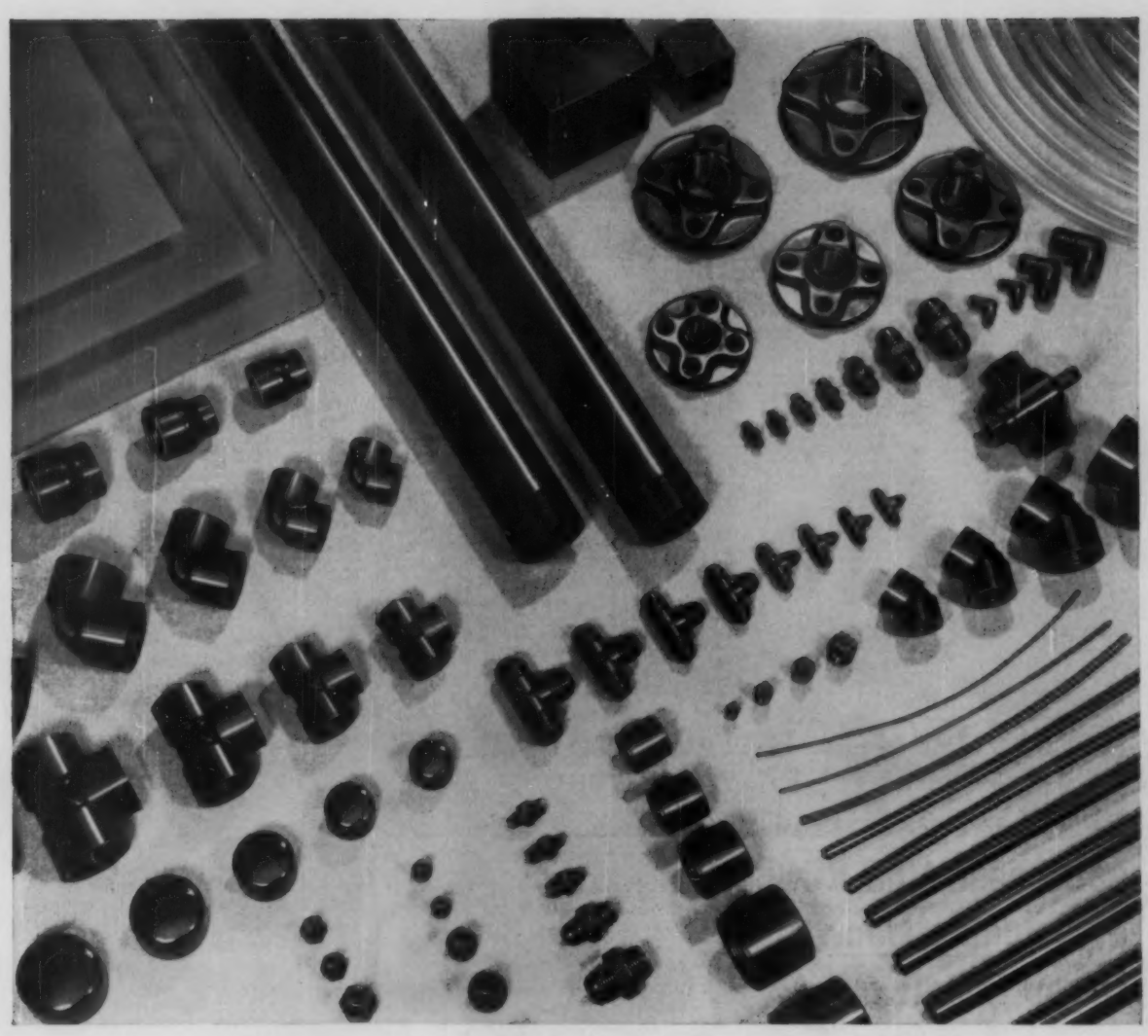
Barber-Colman Co., Wheelco Instruments Div.: New branch office opened at 522 E. Jefferson St., Springfield, Ill., with **LeRoy Peterson** as branch sales manager. **Harold Dirkers,** formerly of Detroit branch, is the new branch manager of the St. Louis office. **Howard Berger,** former Detroit office branch manager, now manager of the Cleveland office. **Stanley Hanson,** formerly of the Chicago office, named manager of the Detroit branch.

Catalin Corp. of America: Chemical Div. formed to handle antioxidants now being produced for the petroleum, chemical, pharmaceutical, and food industries.

Thermosetting and thermoplastic sales realigned on a divisional basis: **Edward W. Bastian,** vice president-sales, Thermosetting Div.; **Frank E. Hadley,** newly created vice president, Thermoplastic Div.; **Viv Moss,** sales manager of special accounts, Thermosetting Div.; **Jack Weiss,** vice president, sales manager of special accounts, Thermoplastic Div. Three new assistant sales managers are **Walter Betenbaugh,** Thermosetting Div., Greensboro, N. C.; **David Stanley,** Thermosetting Div., Chicago, Ill.; and **Alfred D. Veale,** Thermoplastic Div., Cleveland, Ohio.

Tubular Lining Corp. C. J. McBride appointed director of research and **J. Walter O'Brien** production manager. The firm is a compounder and applicator of plastics linings for oil field tubing. Present facilities are capable of lining 5000 lineal ft. of tubing each working shift.

Shaw Process Development Corp.: DiPierro Mfg. Co., Shrewsbury, Mass.; Newark Die Corp., Newark, N.J.; Standard Tool Co., Leominster,



For Quality, Performance and Profit

Choose SARAN with its amazing chemical resistance

In chemical installation where replacement of pipe and fittings due to the action of corrosive chemicals is both frequent and costly, SARAN pipe and fittings meet the challenge. Production soars, maintenance costs and downtime are held to a minimum. Small wonder the acceptance of SARAN grows steadily.

SARAN is a thermoplastic based on vinylidene chloride copolymers—the same resins that have produced famous SARAN WRAP* and SARAN textile fibers. Because of its amazing chemical resistance, molded SARAN is also particularly useful in Saran lined pipe, fittings and valves, rayon spinnerette couplings, paint spray assemblies, tubing, gasoline filters and other applications where service requirements are rugged.

Versatile SARAN has a combination of properties that offers you toughness, flexibility, durability and low water-absorption and vapor-transmission rates.

Dow leadership in thermoplastics, experience in serving customers and dependable production facilities warrant your consideration of the Dow family of plastics. For technical information, see your Dow man soon. Or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Department PL1534B.

*Trademark of The Dow Chemical Company

The complete Dow family of plastics

SARAN

STYRON®

ETHOCEL®

STYREX®

POLYETHYLENE

PVC RESINS

YOU CAN DEPEND ON DOW

designed for TOUGH
PLASTICS REGRANULATION JOBS

American ROTARY KNIFE
PLASTIC GRANULATOR

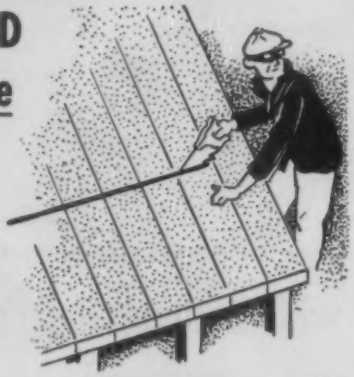
- Capacities to 450 Lbs./Hour
- Uniform Granulation of Plastic Scrap
- Efficient, Once-Through Operation

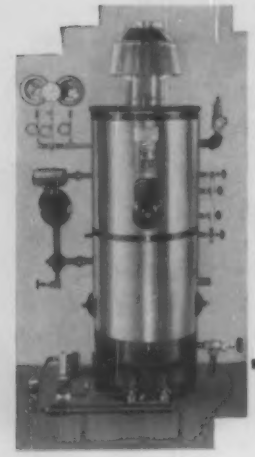
The clean, shearing action of the adjustable rotary cutter blades assure fast, single-operation reduction, constant uniformity, regardless of size, kind or shape of plastic. Wide hopper accommodates larger plastic forms without preliminary reduction. Heavy plate construction and fine tool steel knives give long-life service under tough, constant usage.

WRITE for your copy of "Grinding Plastic Scrap Profitably."

American PULVERIZER COMPANY
Originators and Manufacturers of Ring Crushers and Pulverizers
1117 Macklind Ave.
St. Louis, Mo.

you needn't be ROBBED
of valuable floor space
if you install a
KANE
VERTICAL BOILER
PACKAGE





. . . chances are that floor space is at a premium in your shop or plant. . . . If so, you needn't be robbed of this valuable space by a cumbersome, horizontal type boiler . . . not when a KANE *vertical* BOILER PACKAGE will give you the same or probably better results.

In sizes to 30 HP, the KANE Boiler Package also includes an M-K-O Automatic Feed System to return condensate and supply make-up water as required for highest operating efficiency.

Full details in new Bulletins, No. 2L and No. 4H.

"Engineered Steam at its best . . . over 50 years experience at your disposal!"

(Similar boilers are available for use with oil or combination gas or oil . . . write for Bulletin No. 77D.)

INDUSTRIAL GAS EQUIPMENT DIVISION
CODE OF ETHICS SIGNER
GAS APPLIANCE MANUFACTURERS ASSOCIATION

mko
mears kane o'neil inc.
DIVISION OF S. T. JOHNSON CO.
Church Road, Bridgeport, Pa.
Sales Office: 100-22 Queens Blvd., Forest Hills 75, N. Y.

Companies . . . People

Mass.; Hitchiner Mfg. Co., Milford, N.H.; Arwood Co., New York, N.Y.; and Deloro Stellite, Belleville, Ont., licensed to produce cavities and cores by the Shaw process of precision investment casting. The licensees make plastics molds, die-casting dies, forging dies, and precision castings. Two toy makers have also become licensees: Ideal Toy Corp., Hollis, N.Y., and James Industries, Inc., Paoli, Pa.

The Harshaw Chemical Co.: William A. Harshaw II elected vice president of research; he is grandson of the founder and son of **Chairman W. J. Harshaw. Leslie N. Smith,** with the company since 1919, named vice president of the **Scientific Div.;** he will retain the post of general manager of the division, which he has held since 1951.

Nicholson File Co.: John E. Holt, president of **The Danielson Mfg. Co.,** a subsidiary of Nicholson which manufactures nylon products for industry, elected to the board. Two other directors elected are **Charles E. Fogg,** vice president and secretary, and **Edmond A. Neal,** vice president-Domestic Sales.

Baldwin - Lima - Hamilton Corp.: Transfer of manufacturing and sales operations of the Hydraulic and Compacting Press Dept. from the Eddystone Div. (near Philadelphia) to the Hamilton Div., Hamilton, Ohio, completed and integrated with the Mechanical Press Dept. in Hamilton. **John J. Littley** continues in charge of hydraulic press sales. **Byron B. Belden** is application engineer.

W. E. Shipley Machinery Co., 1421 Chestnut St., Philadelphia, Pa., appointed to handle sales and service in the state of Maryland for presses manufactured by the Hamilton Div., including metal powder and plastics compacting types.

Interplastics Corp. has moved from 654 Madison Ave. to larger quarters at 120 E. 56th St., New York, N.Y. **Albert K. Speier** appointed vice president and sales manager; **Justin Zenner,** Chicago representative. The company is a supplier of raw materials to the plastics industry.

Fibre Glass-Evercoat Co., Inc. has opened a Miami branch at 425 W. Flagler to serve the Florida territory. The company markets a line of kits (consisting of polyester resin, hardener, and fibrous glass) for wooden boat repair and do-it-yourself hull molding.

Isotope Products, Inc. has opened a New England branch office at 5

CUT DOWN YOUR LOSSES IN POLYETHYLENE MOLDING

In the polyethylene field — in molding or in packaging — destructive crazing is often caused by use of Silicone-Type Anti-Stick Agents.

Now you can eliminate this costly "crazing" or "stress-cracking" caused by silicones — just . . .

SWITCH TO IMS ZINC STEARATE DRY POWDER SPRAY!

The unique IMS Aerosol Applicator eliminates dust hazards and waste, allows your operators to direct this effective anti-stick agent right at the trouble spot: on molds, on sealing jaws, in fact anywhere polyethylene tends to stick in molding or handling.

Yes! If you process polyethylene — now you can eliminate crazing and cracking losses. Order a supply of IMS Dry Powder Spray today — it's THE 100% SAFE Anti-Stick Agent for polyethylene!

USE IMS ZINC STEARATE DRY POWDER SPRAY

PRICES—IMS Dry Powder Spray
(FOB Cleveland, Ohio)

Sample Can ---------- $2.00

Per Unbroken Dozen --- $13.80 Net
(At $1.15 Each)

Per Unbroken Gross --- $144.00
(At $1.00 Each)

INJECTION MOLDERS SUPPLY CO.
3514 LEE ROAD • WYoming 1-1424 • CLEVELAND 20, OHIO

Material being cut—Black urea or nameplate plastic, .059 thick (approx. 1/16"). Width of cut or kerf is only .064. Compare with your present cut.

no edge chipping or cracking...

With RADIAL CUTTER New THIN-KERF* Fine Pitch Blades

These new carbide-tipped circular saw blades have been carefully developed to cut smoothly and precisely without edge chipping or cracking . . . eliminate sanding and other finishing operations . . . reduce your material waste by 20% or more. Designed specifically for applications in thermosetting and thermoplastic materials, printed circuitry, expensive woods and veneered plywoods and light gage non-ferrous metals, Radial Cutter THIN-KERF blades are ideal for hand-feed, precision cutting operations and, under certain conditions, for power feed single or gang-cutting operations. Write today for prices and specifications.

RADIAL CUTTER
MANUFACTURING CORPORATION
829 Bond Street, Elizabeth 4, New Jersey
SPECIALISTS AND LEADING MANUFACTURER OF CARBIDE-TIPPED SAW BLADES

Companies . . . People

Pickett St., Marblehead, Mass. **David R. Kneeland,** formerly manager of the firm's West Coast branch, will supervise the new office. Isotope manufactures the Betameter for non-contacting measurement and control of continuous sheet and coating process; the Beta Profiler for quality control in the plastics and paper industries; the Gammagage for non-contacting control of solid and liquid flow processes; and other equipment in five plants located at Buffalo, N.Y., and Oakville, Ont.

Belle Kogan Associates has moved from 362 Fifth Ave. to new quarters at 145 E. 35th St., New York, N.Y. The firm specializes in industrial design.

Mitchell Plastics, Inc.: Henry L. Miller appointed general manager and **Ladd E. Houdek** plant manager. The company is in the custom injection molding business.

Jensen, Inc., 9331 Freeland, Detroit, Mich., is the new name of the firm formerly known as Jensen Specialties, Inc. The company makes industrial ovens and conveyors. **Ben Milt** appointed sales manager; **John J. Casey,** chief engineer; and **Bruce S. Stewart,** factory sales engineer.

Electrical Specialty Co. appointed exclusive representative for the sale of Perspex acrylic sheet in 11 western states by **J. B. Henriques, Inc.,** U.S. distributor of the sheet produced in England by the Plastics Div. of **Imperial Chemical Industries, Ltd.**

American Felt Co.: Hugo Boeddinghaus retired as vice president in charge of the Engineering and Research Div., a position he has held since 1941. **Thomas J. Gillick, Jr.** named manager of the division; **Harold G. Hencken** succeeds Mr. Gillick as director of engineering activities.

Kaykor Industries: Herbert E. Rubin, Aberdeen, Md., named new East Coast representative. **G. Gordon Schmuck,** West Coast representative, now located at 46 Skipper Rd., Pittsburgh, Calif.

Plastic Age Co.: Larry Green, formerly with Copolymer Corp., now plant manager of the Transparent Plastics and Reinforced Plastics Divs. **David M. Ross,** chief of quality control, promoted to assistant plant manager; **Jack Maloney,** supervisor of the Acrylic Plastics Section, promoted to production supervisor; **Howard Young** is new chief of quality control; **A. W. Knieriem,** supervisor of the Reinforced Section, will head the Tool Engineering Dept. **H. E. Renner** now sales manager.

T. C. Ashley & Co., Inc., 683 Atlantic Ave., Boston, Mass., named exclusive New England representative for **Chase Chemical Corp.,** Pittsburgh, Pa. It will sell Chase polyisocyanate resins for urethane foams, naphthenate, and other products.

Packaging Machinery Manufacturers Institute, Inc. has moved from 342 Madison Ave. to larger quarters at 60 E. 42nd St., New York, N.Y.

Midwest Plastics Corp., 738 N. Waco St., Wichita, Kans., is the latest addition to the ranks of custom molders. The firm, which will do injection and compression molding, is equipped to do its own tool and die work. **Ray Hodge** is president.

Durable Formed Products, Inc., New York, N.Y., **Regal Plastic Co.,** Kansas City, Mo., and **Speck Plastics, Inc.,** Port Washington, N.Y., have entered into a working agreement to coordinate know-how, production facilities, sales service, product development and design facilities, and research programs of the three firms on an engineering level. This coordinated program is applicable to

precision forming and fabricating of thermoplastic sheeting, low-pressure forming and matched-metal molding of reinforced plastics, and thin-gage vacuum drawing.

The three companies are not directly or indirectly integrated with each other. They will continue to function as separate, independent firms, but the combined know-how and, if necessary production facilities, of these three firms will be offered as a team to active as well as potential accounts utilizing their services.

Elmer F. Schumacher, general director of sales of **Du Pont's Polychemicals Dept.,** has retired. Prior to 1950, he was director of sales for the Ammonia Dept. which was then consolidated with the Plastics Dept. to form the Polychemicals Dept.; the department now has two sales divisions, one for plastics and the other for industrial chemicals.

Wyman Goss, manager of the Phenolics Engineering and Chemical Materials Dept. of **General Electric Co.,** will deliver a paper on plastics materials before the Machine Design Div. of the American Society of Mechanical Engineers at the **Design Engineering Show**, to be held at the New York Coliseum from May 20 to 23.

William J. Monahan, formerly with The Dow Chemical Co., now plastics sales manager of **Seamco Chemical Co.,** Hanover St., Holyoke, Mass. The firm is currently producing general-purpose and soft-flow polystyrene crystal. Both materials are claimed to have good strength, optimum clarity, and water whiteness with good moldability. A medium- and high-impact polystyrene will be ready for market in the near future.

M. A. Olsen promoted to general manager of all Breskin Publications, including MODERN PLASTICS Magazine; he has been on the business staff for 21 years.

Paul N. Leech appointed middle-Atlantic sales representative of **Emery Industries, Inc.,** Cincinnati, Ohio.

Stedman C. Herman appointed to the Technical Service Dept. of **Shawinigan Resins Corp.,** Springfield, Mass. He will supplement the company's technical service activities in the adhesives industry.

Wayne F. Nelson, previously with American Container Corp., now director of research and development of **A. Schulman, Inc.,** Akron, Ohio; he will be mainly concerned with the development of new and improved compounds, both plastic and synthetic rubber.

Joseph P. Healey, formerly vice president and sales manager of Manco Products, Inc., appointed to

NEW
NON-TOXIC
STABILIZER
ADVASTAB
CZ-11
gives superior long term heat stability

For use in
FOOD WRAPPINGS
BEVERAGE HOSE
MEDICAL TUBING
BABY PANTS
TOYS
and in all other calendering, plastisol or extrusion operations where non-toxicity of finished compound is of primary importance.

Superior in long term heat stability to any other approved calcium and zinc systems.

Samples and data available:

DIVISION OF CARLISLE CHEMICAL WORKS, INC.
ADVANCE
SOLVENTS & CHEMICAL
NEW BRUNSWICK, N. J.

Companies... People

newly created position of general sales engineer of **Standard Tool Co.**, Leominster, Mass. The firm makes presses, cutters, stock and special molds and steel and beryllium copper castings used as mold components.

Charles W. Manly appointed director of service engineering of **Modern Plastics**, 2850 N.W. Fortieth Ave., Miami, Fla., custom designer and fabricator of plastics parts for the aircraft industry, including acrylic, copolymer sheet, etc. The company recently completed a new building and facilities program designed to triple its production capacity by the end of 1957.

Arnold Hanchett, with the company over 35 years, named assistant director of development for **Solvay Process Div., Allied Chemical & Dye Corp.**, New York, N. Y.

Raymond E. White, manager of product control, has been promoted to the **Prolon Div., Pro-Phy-Lac-Tic Brush Co.**, as a special representative in the Sales Dept. Mr. White will handle sales and technical contacts in upper New York state and eastern Ohio. His former responsibilities will be divided between **Leonard Oswin** in the Thermoplastic Div. and **Robert Blondin** in the Thermosetting Div.

Alan G. Richards appointed director of applications for **Bjorksten Research Laboratories for Industry**, Madison, Wis. Bjorksten Laboratories conduct sponsored industrial research in plastics, coatings, laminates, high polymers, organic syntheses, adhesives, etc.

George A. Leeper, formerly with Allied Chemical & Dye Corp., has joined the Phoenix staff of **Desert Sunshine Exposure Tests**, Phoenix, Ariz., as assistant director.

Frank Coffin, sales executive in the Plastics Div. of **Kennedy Car Liner & Bag Co.**, named assistant general manager of the firm's Canadian plant at Woodstock, Ont. The company is a manufacturer of flexible packaging materials.

Thornton F. Holder appointed director of research of **Diamond Alkali Co.**, Cleveland, Ohio, succeeding **Dr. Albert W. Meyer** who has resigned.

Herbert Schoenfield, formerly technical sales service manager of Witco's Emulsol Chemical Corp., appointed to newly created position of manager of polyester sales, **Chemical Sales Div., Witco Chemical Co.**, 122 E. 42nd St., New York, N. Y. He will be primarily responsible for the sale of Fomrez No. 50, a new polyester used in the production of urethane foams.

Abel DeHaan, Jr., named director of the Western Div. of **Tracerlab, Inc.**, Richmond 3, Calif., will be in charge of Tracerlab's enlarged research and manufacturing facilities on the West Coast. The company produces beta gages and other control equipment used in the plastics industry.

Robert E. Reynolds named sales manager of **Artag Plastics Corp.**, Chicago, Ill., succeeding **Edmund R. Borke**, resigned.

Wallace H. Woodrow, formerly with Hale & Kullgren, Inc. and Monsanto Chemical Co., appointed to the newly created post of vice president in charge of engineering for **Dayton Rubber Co.**, Dayton, Ohio.

George M. Schau, with the company since 1935, named general manager of the **Erie Plastics Div., Erie Resistor Corp.**, Erie, Pa. Erie has recently augmented its production of molded parts by molding and finishing facilities at two subsidiary com-

"Halle-lu-jah!"

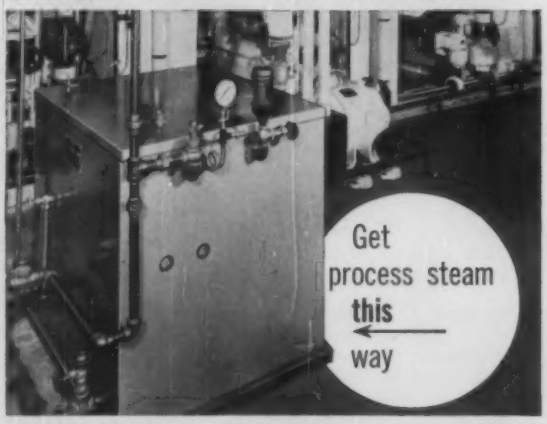
Claremont Flock
Cushions Thermosets Against Shock"

The muscle-building strength of CLAREMONT COTTON FILLERS gives thermosetting plastics the strength to stand up, resist breakage and withstand shock treatment.

Samples Available • *Inquiries Invited*

CLAREMONT WASTE MFG. CO.
CLAREMONT, NEW HAMPSHIRE
The World's Largest Manufacturer of Plastic Fillers

SAVE! SHUT DOWN MAIN BOILER THIS SUMMER...



Put a Speedylectric Steam Generator near your process equipment. You will have steam where you need it, at the flick of a switch . . . paid for out of the dollars you'd waste running the main plant inefficiently on light load all summer. Plus a perfect chance to make any needed repairs on the big boiler. Speedylectric is completely safe . . . no flame, fumes or noise, no heating elements to wear out. Wide range of capacities.

WRITE FOR BULLETIN SG-100

Pantex MANUFACTURING CORPORATION
BOX 660R, PAWTUCKET 4, RHODE ISLAND

Beryllium Copper
PRESSURE CASTINGS
by **FEDERAL**

- Multiple cavities and cores of intricate shape
- Raised letters that can not be hobbed in steel
- Corrosion resistant—long wearing
- Compressive strength over 200,000 PSI
- Thermal conductivity over twice that of steel

Write for Free Illustrated Folder Today

FEDERAL TOOL CORPORATION
3600 W. PLATT BLVD., CHICAGO 45, ILLINOIS

Cut Finishing Costs
THROUGH INCREASED PRODUCTION

CLAMPS AND FIXTURES
Positive pressure and exact registration of the part in the mask. Reduce rejects. Free both hands for productive movements.

AUTOMATIC MACHINES
Increase production hundreds to one over hand methods. Reduce labor costs. Eliminate need of experienced workmen.

MASK WASHING MACHINES
50% faster than any other make. Cut solvent consumption. Avert production delays due to damaging of masks by hand scrubbing.

SPRAY PAINTING MASKS
A competent engineering staff will counsel with you on the most efficient technique for handling your particular requirements.

Send for Free Literature Now!

Conforming Matrix CORPORATION

364 TOLEDO FACTORIES BUILDING TOLEDO 2, OHIO

panies, **Fryling Electric Products, Inc.**, Holly Springs, Miss., and **Andover Industries, Inc.**, Andover, Ohio.

Merle W. Kremer named general manager of the Parts Div. of **Sylvania Electric Products, Inc.**

Norman E. Alexander elected president and director of **Sun Chemical Corp.**, succeeding **Ralph C. Persons** who has retired.

Barto L. Attig appointed to newly created post of sales manager of **American Insulator Corp.**, New Freedom, Pa., custom plastic molder.

James L. Cullen named assistant sales manager of **Flexonics Corp.'s Hose Div.**, Maywood, Ill.

Ray T. Miller Sr., former mayor of Cleveland, elected president of **Fiberglass Ohio, Inc.**, 9603 Clinton Rd., Cleveland, Ohio. The company, organized in 1956, fabricates reinforced plastics parts used in electrical manufacturing, aircraft, and industrial construction.

Frank W. Reinhart, chief of the Plastics Section, National Bureau of Standards, U. S. Department of Commerce, has received the Meritorious Service Award of the Department of Commerce "for major contributions to the science and technology of plastics, and for highly distinguished authorship" from Secretary of Commerce Weeks.

William Hagel, with the firm since 1917 and formerly vice president and executive assistant, appointed vice president in charge of operations of **United Engineering & Foundry Co.**

Eugene F. Hoffman, with the firm since 1946, named manager of the Cincinnati sales office of **U. S. Industrial Chemicals Co., Div. of National Distillers Products Corp.**, succeeding the late **Elmer Bulthaup.**

Thomas T. Engel appointed sales manager of the **Dinnerware Div., Chicago Molded Products Corp.**, manufacturer of the Cloverlane line of melamine dinnerware. Mr. Engel will continue as advertising manager of the firm.

Dr. Jay C. Searer, formerly production manager, named works manager of **Durez Plastics Div., Hooker Electrochemical Co.**, North Tonawanda, N. Y.

Ray Goudeau named sales manager of **Delta Products** and **AMC Supply Divs., Air Accessories, Inc.** He will be in charge of the company's industrial and aircraft supply distribution and manufacturing operation at the Fort Worth main office and the Houston branch office and warehouse. Delta Products fabricates and distributes methacrylate and other plastic and rubber products.

Ray Neubecker named California representative of **Lester-Phoenix, Inc.**, Cleveland, Ohio. His background includes 15 years' experience in the plastics and die casting industry.

Owens-Corning Fiberglas Corp.: Howard S. Neipp, with the firm since 1945 and mid-continent sales manager since 1954, appointed general sales manager of the Pacific Coast Div. He succeeds **William H. Curtiss, Jr.**, recently elected vice president of the company and general manager of the division.

Gerald B. Athey promoted to director of the newly formed Product Design and Development Dept. of **Popular Plastic Products Corp.**, East Northport, N. Y.

Alexander Alexander appointed finishing engineer in the Chicago area for **Hanson-Van Winkle-Munning Co.**, Matawan, N. J. Mr. Alexander will assist salesmen in 15 midwestern states in problems and service relating to the buffing and polishing of plastics and metals.

Classified Advertisements

Modern Plastics reserves the right to accept, reject or censor classified copy.

Employment

Business opportunities

Equipment

Used or resale only

Machinery and equipment for sale

FOR SALE: 1—6"x12" Laboratory Mill, m.d.; 1—Ball & Jewell Rotary Cutter, size 0 m.d.; 4—Horizontal Dry Powder ribbon Mixers, 2000#, 1500#, 800#, 500#; 1—Pfaudler 300 gal. G.L. Jack Agt. Reactor; 1—New 3 Roll 6"x16" Laboratory Calender; 1—Day 15 Gal. Pony Mixer, S.S. Cans, m.d.; 1—Day Imperial #30 Mixer, 75 gal.; 1—Mikro Pulverizer #2th, with motor; 4—Reed-Prentice & W-S Injection Molding Machines, 2-16 oz; Also other sizes: Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. Send us your inquiries. What have you for sale? Consolidated Products Co., Inc., 50 Bloomfield Street, Hoboken, N. J. HOboken 3-4425, N.Y. Tel.: BArclay 7-0600.

FOR SALE: 3—150-Ton Stokes Presses complete with Bar Controls and Boilers; 1—D3 Rotary Preformer; 2—D4 Preformers; 1 Colton #3 Preformer. Merit Plastics, Lynbrook, New York.

FOR SALE: Available at bargain prices: Baker Perkins 50 gallon Steel and Stainless Steel Steam Jacketed Heavy Duty Mixers with Stainless Jacketed Blades, motorized power tilting, motor driven. W & P 200 gallon Heavy Duty Mixer, tilting type, with Sigma Blades. J. H. Day from 1 qt. to 150 gal., Imperial and Cincinnatus D.A. Jacketed, Sigma Blade Mixers. Day 15 to 10,000 lbs. Dry Powder Mixers. Mikro Bantam, 1SH, 1F, 2TH, 3TH Pulverizers. Day, Rotex, Tyler-Hummer, Great Western Sifters. Package Machy. FA, FA2, FA4, Miller, Hayssen, Scandia, Hudson Sharp, Oliver Auto. Wrappers—all sizes. This is only a partial list. Over 5000 machines in stock available for immediate delivery. Tell us your machinery requirements. Union Standard Equipment Co. 318-322 Lafayette St., New York 12, N.Y.

FOR SALE.
One 48 oz. Watson-Stillman Injection Molding Machine With 60 oz. Heating Cylinder. Good Condition. Can be seen in operation.
Reply Box 2123, Modern Plastics

FOR SALE: 800 ton laminating press with 23 openings 26"x38". 300 ton laminating press with 10 openings 40"x40". 300 ton upstroke press 22"x35" platens. Farrel 200 ton 30"x30" platens. 200 ton Hobbing Press 18"x14" platens. D & B 140 ton, 36"x36" platens. Adamson 80 ton, 20"x20" platens. Farrel 200 ton 20"x80" platens. French Oil 120 ton self-contained 18"x22" platens. W. S. 40 ton self-contained with 12"x12" elect. heated platens. Also Lab. to 2,000 tons from 12"x12" to 48"x48". Hydr. Pumps and Accumulators. Stokes Automatic Molding Presses. Van Dorn 1 oz. Injection Molding Machine. Kux 2½" dia., single punch preform machine. Mills and Calenders to 84". New Seco 6" x13" and 8"x16" Lab. Mixing Mills and Calenders. Hartig 3¼" Plastic Extruder. Plastic and Rubber Extruders, Oxford 57" Slitter. Rotary and single punch Preform Machines, ½" to 4" Injection Molding Machines 1 oz. to 60 oz. Baker-Perkins & J. H. Day Jacketed Mixers. Plastic Grinders. Gas boilers. Partial listing. We buy your surplus machinery. Stein Equipment Co., 107-8th Street, Brooklyn 15, N. Y. Sterling 8-1944.

PRINTING MACHINE FOR SALE: Substantial saving on a 1956 Markem two color Printing Machine Model 25 AD complete with automatic turntable and air ejection system. This machine has been used very little in production and can be demonstrated upon request. Ger-Ell Manufacturing Company, 2446 South Indiana Avenue, Chicago 16, Illinois. CAlumet 5-8700.

FOR SALE: Vickers hydraulic units 8GPM on 3HP Motor, Line start, Oprvalve, controls, compact closed unit (9) $275 Ea. Custom Built Hi-Lo Units 28 GPM Vickers & 3 GPM rated to 5000 PSI, On 75 Gal. resvr. & all controls etc 7½ HP. for 3000 PSI, $1400 Ea. Year Guarantee. Units built to suit any press operation. Molding Presses; available for insp. List your surplus, for best user's price, direct action. Hydraulics Industrial, 2020 Renfrew, Elmont, N.Y.

FOR IMMEDIATE SALE: One Robbins Sheet Takeoff Unit with three chrome plated 26"x6" water cooled Rolls, fifteen-foot Conveyor Bed, two rubber Pinch Rolls, automatic movable Knife Shear, and Rails. Also one 26" flat Sheet Die, variable Jaws, complete with 14 KW Cast Heaters. Practically new, excellent condition, real opportunity. Reply Box 2102, Modern Plastics.

FOR SALE: Marco Process consisting of Homogenizer, Roto-feed Mixers, Reactors, Kombinators and pumps all stainless steel. Also Sigma Blade jacketed Mixers, Pellet Presses, Mikro Pulverizers, Fitzpatrick Comminuting Machines, etc. We Buy Surplus Equipment. Perry Equipment Corp., 1429 N. 6th St., Phila. 22, Pa.

ALMOST NEW—MAKE BEST OFFER: 1-25 gallon Annealing Tank manufactured by Sta-Warm Electric Company, Ravenna, Ohio. Type V953-WS, Serial No. 4706-A. 8.8 Amps, 440 Volts AC, 3 Phase 60 Cycle. 1 Acromark specially constructed Counter Wheel Marking Machine Model 9AA4, Serial No. 97176. Manufactured by The Acromark Company, 9-13 Morrell St., Elizabeth 4, N.J. Approximately 200 pounds of hitec heat transfer salt (sodium nitrate—sodium nitrite) manufactured by E. I. du Pont de Nemours, Inc., Wilmington, Delaware. This salt is in a wooden barrel. Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, New Jersey.

FOR SALE: Vacuum Metallizers 36", 66". Injection Presses: 8, 12, 16 oz. Reed. 2, 4, 9, 16 oz. HPM. 6, 8, 12 oz. Lester. 8 oz. vert. Giddings. 4 oz. Lewis, 1, 2 oz. Van Dorn.—Extruders: 2½, 3¼" Hartig. 24" & 30" Sheet Dies, 30" & 52" Pull-Off. 48" Sheet-Stacker. 14" & 6" Dulmage Meter Pumps. Conveyors. Despatch 48"x 72" Sheet Preheat Oven.—6 Drawers Despatch Preheat Oven. Cumberland Grinders No. 0 & 10. Apex 2 color Container Imprinter. Compression & Transfer presses 50 to 600 T. Elmes Hydrolair press 30 T. 2 & 5 KW Electronic Preheaters. Stokes T Preform Press. 1000 lbs. Patterson Conical Mixer. Baker-Perkins 200 gal. Mixer. Vac. Forming machine Formvac 40x60"—All Midwest locations. List your Surplus equipm. with me.—Justin Zenner, 823 Waveland Ave., Chicago 13, Ill.

COMPLETE RAW MATERIAL to finish phenolic mixed material plant, never used in original crates. Will sell all or part. Vacuum pneumatic conveyors, horiz. batch premixers, special brush type sifter, rotary air seal feeder, slide valves, hammer mills, saw tooth crushers, chip cooler, knife cutter, gyrator sifter, automatic bulk weighing scale, plastic two roll mills 24"x60" Farrel; Rotary batch blender, scalping screen, ball mill, atmospheric dryer, dust collector. Eveready: Box 638, Bridgeport, Connecticut, EDison 4-9471. E. J. McCallum, Jr.

FOR SALE:
1—62" Cameron Slitter, Type 6. Completely overhauled, new arms, knives, motor. Perfect condition—$3900.00.
1—60" Dinker. Completely overhauled. New bearings, motor, safety devices, etc. —$750.00.
1—Radio Receptor, Model K 20 S Thermatron, 2 KW, Serial 2666, with P 18 Press No. 2643, including 1 Arc Suppresser and 60" Turntable—$2750.00.
1—18" Polyette Bag Making Machine, brand new—$1750.00.
We are principals, not dealers.
Reply Box 2215, Modern Plastics.

(*Continued on page 280*)

SPEED NUTS® WITH A HANDLE

eliminate fastener fumbling!

Multiple-unit strips of Tinnerman Flat-Type SPEED NUTS permit cost-cutting, split-second fastening. That's how Reznor Mfg. Co., Mercer, Pa., saves up to 40% in the assembly of louvers for its Suspended Gas Unit Heaters!

With strip in hand, the operator drives a screw into the end SPEED NUT, easily snaps off the tightened fastener from the strip and quickly places the next SPEED NUT in screw-receiving position. No lost motion feeling or fumbling for single fasteners, spanner or lock washers. Louvers are securely fastened, and are easily adjusted to control air distribution.

This is an example of the versatility of SPEED NUTS. It is also an example of the assembly advantages of SPEED NUT brand fasteners. Over 8000 types give you an answer to almost every fastening problem. See your Tinnerman representative or write for complete details.

TINNERMAN PRODUCTS, INC.
BOX 6688 • DEPT. 12 • CLEVELAND 1, OHIO

TINNERMAN

Speed Nuts®

FASTEST THING IN FASTENINGS®

Canada: Dominion Fasteners, Limited, Hamilton, Ontario. Great Britain: Simmonds Aerocessories, Limited, Treforest, Wales. France: Simmonds, S. A., 3 rue Salomon de Rothschild, Suresnes (Seine). Germany: Hans Sickinger GmbH "MECANO", Fempa - I - Lippe.

(Continued from page 278)

PLASTICS MACHINERY

Cutters, Rotary, Plastic
Ball & Jewell #½, 10 HP MD, New 1954
Ball & Jewell #2 with 40 HP MD, Extra Knives

Extruders
Hartig 2" Elec. Htd., 7½ HP Reliance V-S Drive, 98% New
MPM 3½", New 1955, With Sheeting Dies & Takeup Rolls
Hartig 3¼" Elec. Htd., 45" Barrel, 20 HP Reliance V-S Drive

Injection Molding Machines
2 Oz. Van Dorn, Oversize Cylinder, Model H-200
6 Oz. Watson-Stillman with 2 Wheelco Controls
16 Oz. Reed-Prentice No. 10-E-16, Elec. Htd., 1948

Mills, Rubber/Plastic
6" x 12" Lab Type with 5 HP MD
18" x 50" Farrel, Rubber/Plastic, 75 hp M.D.

Presses, Molding
15 Ton Baker Fully Automatic
15 Ton Stokes No. 200 D-2 Automatic (10)
15 Ton Stokes 200D-3
30 Ton, Baker Full Automatic Model 958, Excellent Condition, New 1951
40 Ton, Francis 4 Opening, 12" x 12" Elec. Heated Platens
50 Ton Stokes, Semi-Auto., Self Cont.
100 Ton Stokes Standard Semi-Automatic, Power System, Timing Controls
100 Ton, Lake Erie Hi-Speed, 24" x 24" Bed, 12" DLO, Self. Cont.
113 Ton French Oil Mill, 6 Opening, Elec. Htd. Platens 15" x 18"
113 Ton R.D. Wood 5-Opening Elec. Htd. Platens 14" x 20"
150 Ton Stokes Standard Semi-Automatic, Power System, Timing Controls
175 Ton Viceroy Slab-Side 24" x 24", Elec. Htd. Platen with Hand Pump
200 Ton Stokes Semi-Automatic, Power System, Timing Controls
225 Ton Farrel 14" Ram x 18" Stroke, L-R 26½" x F.B. 24½" 7½ HP MD
300 Ton Stokes Semi-Automatic, Power System, Timing Controls
625 Ton, Farrel, Steam Platens 52" x 52", Pump, Mtr., Controls, Under Power
669 Ton, Morane, 3 Upmoving Rams, 16" Stroke
1200 Ton, HPM, 15 Openings, 100" x 120" Steam Platens, Self-Cont. (2)
4000 Ton Mesta, 3 Upmoving 30" Rams x 20" Str. Bed 34" x 351"

Presses, Hobbing
400 Ton Robertson, 13" Ram x 4" Stroke complete with pumps & 15 HP MD

Furnaces and Ovens
Megatherm, 3/60/220, 5 EN, 2-3 lb. Phenolic Per Min. (8)
Despatch Mdl. P1hd-8 8 Drawers, 12 x 18 x 2½" (2)
GE High Frequency Plastic Preheater Model 4-H82A1

Tablet Machines
Model "E" Stokes, Complete with MD
Model R Stokes, Single Punch, Variable Speed Motor Drive, 3 HP
No. RB-2 Stokes, 16 Station, Motor Drive, 2 HP
Model 45 Defiance, 200 Ton, 15 HP, Vari-Speed, MD
Model F, Stokes, Single Punch, MD
No. 5 Arthur Colton, Motor Drive, 3 HP
No. DDS-2 Stokes, 23 Stations, US Vari-Drive, 10 HP
Model T Stokes Hydraulic Equalizer, MD

Mixers
No. 3A Banbury, 150 HP Md Rubber/Plastic
No. 3 Banbury 75 HP MD Excellent Condition Slide Door Construction.

Calenders
24" x 48" Farrel-Birmingham, 3 Roll, 50 HP DC Motor
9" x 48" American Tool 4 Roll Doubling, Belt Drive

Paint/Ink Mills
5" x 12" 3 Roll J. H. Day Lab Mill

Pelletizers
Mitts & Merrill Model 10-N-6 15 HP V.S. Drive

Make Us Your Prime Source for All Types of Plastics Machinery
Hydraulic Presse from lab size to 5,000 ton
Injection Molders from ½ oz. to 60 oz. size
Extruders from lab size to 12"
Plastic & Rubber Mills and Calenders up to 84" size
Tablet Preform Presses, single punch and rotary, all sizes
Mixers all sizes, types and capacities

Also a complete selection of tumbling barrels, take-up equipment, hydraulic power units, pumps, ovens, blenders, scrap cutters, pelletizers, coating equipment and laminating equipment.

JOHNSON MACHINERY Co.
683-P Frelinghuysen Ave., Newark, N.J.
What Do You Need? What Have You to Sell?

THROPP LABORATORY CALENDER
Vertical calender for sheeting PVC film. 3 stainless steel rolls, 15"x6", adjustable speed control, spur gear drive to General Electric 5/7½ hp, dc motor type-CD, 575/1750-rpm, thymotrol push button control, General Electric control panel, with relay switches, 1 Trumbull type-RBA, 60-amp., 3-pole safety switch.
Reply Box 2104, Modern Plastics.

FOR SALE: 1—1000 ton hydraulic press 66x50"—10 pening; 1 NPM 1¼" electric extruder; 1 Cumberland 14" rotary chopper; 2 Stokes model TR preform presses; 6 electrically heated hydraulic presses, 10, 30 and 50 ton; also mills, mixers, slitters, etc. Chemical & Process Machinery Corp., 52 Ninth St., Brooklyn 15, N.Y. Tel.: HYacinth 9-7200.

FOR SALE: 2—Baker Perkins 316 SS, 100 and 50 gal. jacketed, double arm Mixers; 6—Day 250 and 100 gal. double arm Mixers; 1—Robinson 90 cu. ft., 316 SS Powder Mixer; 2—Two Roll Mills 6"x12"; 8—Stokes Model DD2, DS3, D3 and B2 Rotary Preform Presses; 1—Stokes #294 single punch Preform Press; 4—Stokes Model "R" single punch Preform Presses; 1—Kux Model 15-25 Rotary Preform Press; Also: Sifters, Banbury Mixers, Powder Mixers, etc., partial listing; write for details; we purchase your surplus equipment; Brill Equipment Co., 2407 Third Ave., New York 51, N.Y.

FOR SALE: (6) new 100 ton, 10" ram, 10" stroke @ $1250; (7) 200 ton, 9" stroke, 14" ram, 36x36, @ $2150; (6) 200 ton, 9" stroke, 15" ram, 30x30 @ $1850; (1) 50 ton complete, 18x18 @ $1850; (1) 200 ton 16" ram, 30x30 @ $2450; (2) 200 ton 16" ram, 42x42 @ $2850; (1) 200 ton, 15" ram, 42x42 @ $2600; (3) 250 ton (2) 12" ram, 30x60 rebuilt @ $3675. Hydraulic Sal-Press Co., Inc., 386-90 Warren Street, Bklyn, N.Y.

FOR SALE, SURPLUS MACHINERY: 1951 Yoder Steel Slitter, model L18, serial number 6018, Ten 8 oz. Fellows-Leominster Molding machines, 1 Silver Mfg. Paper Shredder, serial #195, two 12 oz. Lester Molding machines, 1 Kux, model BH30 Die Casting machine suitable for zinc.
Reply Box 2138, Modern Plastics.

FOR SALE: Four dual control Dispatch Ovens. Style—V-41-2HD. Type—Electric. Control—Auto. Volts—220-PH C-1-60, P-3-60. Heat—650° F. K. W.—70. Amp.—184. Serial—47670. Parnat Precision Machine Works, Inc., 1816 Boston Rd., N.Y. 60, N.Y. TU 7-0600.

FOR SALE: Alsteele Plastics Grinder. Model 6x6. 1.5 h.p. motor, 220-440 v, 3 phase, with motor control. Thoroughly reconditioned at factory. Like new. Sheffield Plastics, Inc., Shrewsbury Road, Sheffield, Mass.

FOR SALE: Dual Pumping Units in stock and Custom Built; Rebuilt Hydraulic Presses FOM 75-170 tons, platen area from 17x18, 18x29, 18x35; Baldwin Southwark 75-170 tons, 24x24; D&B 10-60 tons 12x12; Laboratory Presses, Preform Machines, etc. Universal Hydraulic Machinery Co. Inc., 285 Hudson Street, New York City 13.

FOR SALE: 2000 ton W-S Press, 12" ram stroke, steam platens 60x46", with Vickers Pumps—one French Oil Mill 200 ton self-contained Press, 48"x72" platens —Injection Machines 6 to 20 oz.—50 ton 12"x12" Molding Presses—¾" double solenoid and cam operating valves,—Carver laboratory presses—6"x12" laboratory mills. Plastic Machinery Exchange, 426 Essex Ave., Boonton, N. J., Telephone DE 4-1615.

FOR SALE: 1 oz. Van Dorn; 1 oz. W-S vert.; 2 oz. Van Dorn; 4 oz. Lewis, 1953, $4250; 4 oz. Lester, $3000; 4 oz. Lester, fully aut. w/low pressure closing; 6 oz. H.P.M., 1955; 9 oz. H.P.M. w/20 oz. preplasticizer; 8 oz. Reed-Prentice, 1947, w/10 oz. cyl. & plunger advance, 8 oz. Lester w/solid frame, $5000; 8 oz. Reed-Prentice, s.l., $3750; 8 oz. DeMattia, toggle; 12 oz. Reed-Prentice, $12,500; 12 oz. R-P Model E; 16/20 Reed-Prentice 1956; 12 oz. Fellows, 1949; 20 oz. H.P.M.; 22 oz. Impco vert.; 150 ton Stokes w/top trans. ram; Auto-Vac vacuum forming mch., 30"x50", w/drape attach.; Double end tumblers; grinders; ovens. Partial listing —Other equipment available. Acme Machinery & Mfg. Co., 2315 Broadway, New York 24, N.Y. SU 7-1705.

FOR SALE: 64 Oz. Injection Molding Machine with Pre-Plasticizer. 750 Ton Clamp. Mold Size 32" vertical, 50" horizontal. 8 & 4 oz. Injection Molders. Aaron Machinery Co. Inc., 45 Crosby St., New York 12, N. Y. Tel.: WAlker 5-8300.

Machinery and equipment wanted

WANTED: 4 Roll Calender and Mixing Mill in good working condition wanted by Manufacturers of P.V.C. Foil. Detailed offer invited. Reply Box 2130, Modern Plastics.

WANTED: Large injection molding equipment with clamp 600 tons or greater. Write giving all details to Olympic Plastics Company, Inc., 3471 So. LaCienega Blvd., Los Angeles 16, California.

WANTED: Injection presses 8 to 16 oz. and other auxiliary equipment for new plant. Please supply all details first letter. Reply Box 2125, Modern Plastics.

Materials wanted

WANTED.
Plastics Scrap and Rejects of all kinds. Ground and unground. Also rejected molded pieces and surplus virgin molding powders. Top prices paid.
Reply Box 2100, Modern Plastics.

(Continued on page 282)

SALES REPRESENTATIVES
Industrial Resins

Several eastern territories. B.S. Engineering or Chemical degree preferred. Thermosetting resins experience desirable. Age 26-35.

Please send complete resume to

Personnel Department
BARRETT DIVISION
Allied Chemical & Dye Corp.
40 Rector St.—New York, N.Y.

• UNIFORM
• STABLE
• BRILLIANT
HOMMEL
PIGMENTS FOR PLASTICS
• Uniform color brilliance bring products to life
Replace your color PROBLEMS with color PERFECTION! Hommel's inorganic pigments for PLASTICS assure you color uniformity and will bring your products to LIFE! Our technical staff and samples are at your service . . . write or phone!
"The World's Most Complete Ceramic Supplier"

THE O. HOMMEL CO. PITTSBURGH 30, PA.
West Coast Warehouse Laboratory, and Office
4747 E. 49th Street Los Angeles, California

Put our metal powders experience to work in your plastics

Metals Disintegrating Company, the world's largest manufacturer of finely divided metals, has the experience and research facilities to help you put metal powders to work in your plastic products. We can supply MD aluminum, iron oxide, copper or virtually any metal or alloy in a wide range of particle sizes and in lots of up to 40,000 pounds.

Whether you are considering metal powders as reinforcement, a heat transfer agent, for coloring or as an accelerator, Metals Disintegrating Company invites you to write for specific information on your application. We can help you choose the correct grade and type for your product.

MD PRODUCTS
METALS DISINTEGRATING COMPANY, INC.

GENERAL OFFICES: Dept. P, Elizabeth B, N. J.

(*Continued from page 280*)

SCRAP WANTED: All Types. For quotations contact: Claude P. Bamberger, Inc. Not Connected with any other Firm of Similar Name. One Mount Vernon Street, Ridgefield Park, N.J.

WANTED.
Vinyl, polyethylene and styrene scrap for our manufacture of molding and extrusion compounds. We can use rigid from vacuum forming, lumps, bleeder, slabs, trimmings, rejects—anything suitable for reprocessing. Send samples and details or telephone. Steady buyers since 1940.
Rotex Rubber Company, Inc.
1-23 Jabez Street, Newark 5, N.J.
MArket 4-4444

Molds for sale

FOR SALE: Complete line of Houseware Molds, Comb Molds, also some novelty and specialty items. No reasonable offer refused. Send for list. Reply Box 2122, Modern Plastics.

Molds wanted

WANTED: Injection molds—one item or complete line of proprietary consumer articles, also interested in molds for industrial parts such as knobs, handles, fasteners, boxes, etc. Will consider purchasing complete injection plant with end products or parts line. Designers: New items wanted—cash or royalty. Victory Mfg. Company, 1722 West Arcade Place, Chicago 12, Ill.—Estab. 1930.

Help wanted

PLASTICS ENGINEER OR MECHANICAL ENGINEER interested in plastics: Excellent opportunity in Southeastern U.S. with well-established company that has recently branched into plastic injection molding and extrusion. Responsibility includes design, alteration and repair of injection molds, and design and cost estimates of new plastic products. Experience desired but not absolutely essential. Replies held in strict confidence. Salary open and excellent fringe benefits provided. Reply Box 2124, Modern Plastics.

EXTRUSION SALESMAN, technical background essential, for greater New York metropolitan area, later out of town. Reply Box 2129, Modern Plastics.

VINYLS: We are looking for a Chemical Engineer with the equivalent of at least five years' experience in formulation, development and processing of calendered vinyl compositions. He should be familiar with plant equipment and operations. Press molding experience desirable. A career opportunity exists for a man with leadership potential. Excellent employee benefits with the oldest manufacturer of floor and wall coverings in the country; a nationally known, multi-plant, progressive organization. Forward full resume including salary desired to Warren F. Bietsch, Personnel Administrator, Congoleum-Nairn Inc., 195 Belgrove Drive, Kearney, New Jersey.

POLYETHYLENE EXTRUSION DEPT. HEAD. The man we desire must be a highly capable individual, presently holding a responsible position in the Extrusion of Polyethylene film in all its phases. Must be well versed in mechanical and industrial engineering. His duties will be installation supervision from engineering to shipping. He will be expected to produce quality products at the lowest possible cost. If you can meet these requirements, please send a complete detailed resume, including expected salary. All replies held in the strictest confidence. Location, metropolitan New York.
Reply Box 2101, Modern Plastics.

ENGINEER: Well established Eastern plastics concern has a position available for a Chief Mechanical Engineer who has a good background knowledge of thermoplastics and is familiar with Injection Molding and Extrusion.
Practical experience required in designing, developing, and estimating of molds, tools, products, jigs and fixtures. Supervise mold making and machine shop in coordination with contract mold makers. Send resume and starting salary requirements.
All answers will be kept confidential. Our employees know of this advertisement. Reply Box 2131, Modern Plastics.

WANTED: By expanding Southern California molder experienced injection molding personnel. Engineers, foremen and setup men. Reply Box 2132, Modern Plastics.

PLASTICS AND POLYMER RESEARCH
Engineers, Chemists, Physicists
Unusually attractive permanent positions are available to conduct research in the field of plastics and polymer chemistry. Rapidly expanding program in our new, well-equipped, air conditioned laboratories in suburban Delaware Valley area will continue to include one or more of the following: synthesis of new monomers, fundamental studies of polymerization mechanisms, evaluation of the physical properties of the polymers, process studies for thermoplastics and reinforced plastics, applications engineering in the fields of architecture, aircraft, automotive, appliances, etc. We are not necessarily looking for experience in the field, but need topnotch young men with a BS, MS, or PhD who have a sound foundation in Organic Chemistry, Physics or Engineering. Primarily we want creative thinkers with a capacity for sound analytical reasoning. Write full details of training, general background, and salary expected to: Rohm & Haas Company, Dept. O.T.E.—3, 5000 Richmond Street, Philadelphia 37, Pa. Replies will be acknowledged and treated in confidence.

CHEMICAL ENGINEERING, Production and Development in Plastics.
Panelyte Division
St. Regis Paper Company
North Enterprise Avenue
Trenton 8, N. J.

PHYSICAL OR POLYMER CHEMIST: MS or PhD preferred to carry out polyethylene polymer research work of a basic nature. Texas Gulf Coast location. Well established company with ample opportunity. Permanent position with excellent employee benefits. Send resume, recent photograph and salary requirements. Reply Box 2116, Modern Plastics.

SPEER CARBON COMPANY.
As part of an expanding research and development program in the field of carbon products and electronic components, several excellent opportunities are available. Resins, plastics and high polymer applications chemist. Organic resins chemist to initiate studies on the application of these materials in both electronic components and carbon products fields. A new laboratory is under construction at Niagara Falls, N. Y. to accommodate the expansion of our Research and Development team. Representative available for interview at A. C. S. meeting April 8-11. Interested persons are invited to submit a complete resume and salary history to:
Mr. M. H. Renshaw
Director of Personnel Relations
Speer Carbon Company
St. Marys, Pa.

EXTRUSION SPECIALIST: Man with knowledge of all phases of the extrusion field, including machine set-up, die design, ability to handle people. Reply Box 2106, Modern Plastics.

PRODUCTION MANAGER-SUPT.: Well known boat manufacturing concern now using hand layup method of boat construction wishes experienced person to set up and look after low pressure molding by vacuum or pressure bags or suitable similar procedure. Kindly state your experience and expected salary to Box 2120, Modern Plastics.

PLASTICS MOLD SUPERVISOR.
Wanted: Experienced man to take charge of plastics mold department of our long established mold business. Must be thoroughly experienced in designing and in supervising the making of all types of plastics molds. Call or write for interview.
Mechanical Mold & Machine Company,
962 South High Street,
Akron 11, Ohio
JEfferson 5-3131.

CHEMIST: 1-3 years experience for evaluation of polyester resins, polyurethanes in reinforced plastics, elastomers and foams.
American Alkyd Industries
Broad & 14th Streets
Carlstadt, New Jersey.
GEneva 8-4332.

PRODUCTION FOREMAN: Quality minded aggressive young man to help superintendent with coating and embossing. General knowledge of plastics, lacquers, and rubber necessary. Salary open for right man. All replies confidential. Send complete information to: Elfskin Corporation, Main Street, Cherry Valley (Worcester), Mass.

HELP WANTED: Laminator and Coater of foil and film—requires experienced salesman for diversification and expansion of laminating department. Reply Box 2114, Modern Plastics.

SALESMAN FOR PLASTICS MATERIALS. Established firm. General areas open. Experience preferred. Also will buy materials. Must be energetic and resourceful. Excellent future and benefits. Our employees have been notified. Salary open. Send resume. Reply Box 2103, Modern Plastics.

(*Continued on page 284*)

Make

MODERN PLASTICS'

articles do double duty!

Reprints of articles and features that appear in MODERN PLASTICS are often surprisingly inexpensive when ordered in quantity. Many companies make it a practice to have stories which have a bearing on their business reprinted for distribution to their own personnel, customers, prospects, stockholders, or to other interested groups.

Whenever you see editorial matter of this type in MODERN PLASTICS magazine or the Encyclopedia Issue which you can use in reprint form, in quantities of 100 copies or more, write and quotations will be furnished promptly.

INDUSTRIAL MAGAZINE SERVICE

An Affiliate of Breskin Publications

575 Madison Avenue **New York 22. N. Y.**

Announcing

a new source of precision plastic molding

The newly organized P. & H. ENTERPRISES is staffed by experts with years of experience designing all types of dies and molds. This extensive know-how is available to you through an organization set up to handle your plastic molding needs—from mold design right through production of the finished part.

ENGINEERING, TOOLING AND MOLDING OF PLASTIC PRODUCTS

JAMES HAMMOND *JOHN PATERSON*

P. & H. ENTERPRISES

121 West 64th Street, New York 23, N. Y.

SU 7-6353

Use your Encyclopedia Issue!

Don't Overlook the Helpful Plastics Charts

Nine important charts summarize technical data on plastics films, adhesives, coatings, laminates, plasticizers and other vital topics. The plastics properties chart, perhaps the most referred-to section of the Encyclopedia, measures 45" x 28" and is suitable for wall mounting.

Most of the material in your copy of the Modern Plastics Encyclopedia Issue is *work* data—information which companies working with plastics can put to valuable use, day-in and day-out.

This 1,122-page volume gives complete coverage to such important subjects as the characteristics of plastics materials, and the employment of fillers for lowering the cost and increasing the strength of plastics parts. Plastics coatings and foamed plastics are discussed exhaustively, as are all important finishing and decorating methods. New cost-reducing slants on vacuum forming, deep drawing, injection molding, extruding, and other production techniques are explained, too.

Countless hours of hunting for sources of supply can be saved by referring to the efficiently indexed Buyers' Directory and to the helpful advertisements of leading suppliers.

MODERN PLASTICS

A Breskin Publication

575 Madison Ave., New York 22, N. Y.

(*Continued from page 282*)

COMPRESSION MOLDING SUPERINTENDENT: Large New England plastic molder seeks compression molding superintendent to assume full responsibility of a 90 man compression molding operation. Vast technical background not essential but must have good leadership and administrative qualities. Will pay relocation expenses. Send resume and salary requirements to: Box 2111, Modern Plastics.

TOP FLIGHT PLANT SUPERVISOR. Extraordinary opportunity to join the executive staff of a leading plastic manufacturer for man experienced in the extrusion of rigid thermoplastics. Starting salary up to $10,000, opportunity to participate in earnings, plus many other additional benefits. Located in Metropolitan area—ideal for better family living. Replies held in the strictest confidence. Send resume direct to President. Reply Box 2128, Modern Plastics.

CHEMIST: Experienced in formulation and manufacture of phenolic compounds. Position in Pennsylvania with substantial custom molding company. Age no barrier. All replies handled in strictest confidence. Write complete details to Box 2109, Modern Plastics.

ENGINEER: Midwest pharmaceutical company requires industrial design engineer for design of special packaging and component parts. Knowledge of plastic materials and molds necessary. Salary open. Reply Box 2108, Modern Plastics.

CHEMIST.
Thoroughly experienced in manufacturing vinyl printing inks for film and sheeting. Excellent salary. Permanent position. Reply Box 2134, Modern Plastics.

AVAILABLE IN CLEVELAND: An unusual opportunity for an experienced man to sell and service leading manufacturer's Polyethylene Resins in Northern Ohio and Northwestern Pennsylvania. A man who can produce will be paid accordingly—salary and incentive compensation program. Plant training period and full sales assistance offered. All replies should state complete qualifications, and will be held in strict confidence. Reply Box 2107, Modern Plastics.

ENGINEER: Experienced in designing compression and injection molds. Age no barrier. Location in Pennsylvania with progressive molding company. All replies handled in strictest confidence. Write complete details to Box 2110, Modern Plastics.

COLOR MATCHER, thoroughly experienced in gravure printing on vinyl film, excellent salary, permanent position, fringe benefits, Brooklyn plant. Reply Box 2135, Modern Plastics.

Situations wanted

INJECTION SUPERVISOR AND ENGINEER: Supervised over 100 people, record of low turnover. Successfully handled reorganization of small plant. Engineering experience molds, molding and production problems. General Management experience with financing, accounting, office procedure, customer contact. University graduate, prefer Midwest location. Reply Box 2126, Modern Plastics.

REINFORCED PLASTICS CONSULTANT: Research. Engineering. Design. Development. Production. Marketing. MIT graduate, Chemical Engineering, Business and Engineering Administration degrees. Experienced in all phases of reinforced plastics. Available to industrial design, engineering consultant, and management consultant firms; companies interested in entering, or those having special problems in, reinforced plastics. Reginald B. Stoops, 445 Park Ave., New York 22, N. Y., Tel.: MU 8-3800.

PLANT SUPERINTENDENT, general foreman, 15 years experience, in injection, Compression, Transfer and extrusion molding, coloring, compounding, vinyl scrap-reclaiming, broad knowledge on molds and machine shop experiences, all set-ups of equipments, molds, maintenance, high efficiency in production, quantity-quality controls, personnel, technical personnel. Reply Box 2118, Modern Plastics.

PLASTICS ENGINEER: 14 years diversified background in compression, transfer and injection molding (8 years in supervisory capacity) covering experimental, developmental and production work. Background includes mold design and consulting. Desire managerial position. Southern location, Florida preferred. Reply Box 2119, Modern Plastics.

Sales agents wanted

SALES REPRESENTATIVE for well known dry color company who is now calling on molders and extruders, thermoplastics. Liberal commission basis. Most territories open. Reply Box 2105, Modern Plastics.

SALES REPRESENTATIVES WANTED: Manufacturer of machinery, dies, molds and related equipment for the plastics industry requires salesmen to add a highly profitable line to their current selling efforts. Representation desired throughout the United States, Mexico, and Canada. Applicants should be calling on industrial accounts and handling allied non-competitive lines. Commission basis. Reply Box 2113, Modern Plastics.

COMMISSION REPRESENTATIVE: Leading manufacturer of fiberglass epoxy tubing seeking experienced sales representatives. New revolutionary production techniques result in highest quality, high temperature, precision tubing in sizes, shapes, and lengths previously unattainable. Other products include fiberglass polyester tubing, copper clad tubing for printed circuits, precision commutators, and slip ring assemblies. Many areas open. Reply Box 2127, Modern Plastics.

MANUFACTURERS REPRESENTATIVES WANTED: By Custom Molded Plastics company located in New England. State type of accounts now contacting. Reply Box 2117, Modern Plastics.

POLYESTER RESIN SALES OPPORTUNITY: Rapidly expanding manufacturer of quality specialty and general purpose Pleogen Polyester Resins has some territories open as side-line for sales representatives selling allied line such as fiberglass cloth or mat, etc. Mol-Rez Division, American Petrochemical Corporation, 3134 California St., N. E., Minneapolis 18, Minn.

Miscellaneous

Have you **THERMO-PLASTIC BUSINESS** with a volume of $1,000,000 or more a year? Could you increase your volume with additional capital and the help of a Toy Engineering staff? Are you interested in selling out with present management staying on a profit sharing basis? Replies treated with strictest confidence. We are AAA-1 Plastic Manufacturing Company.
Reply Box 2121, Modern Plastics.

DUTCH PATENTHOLDER of new system sungoggles, patented in USA, Canada, Great Britain, South Africa, Holland, Belgium, France, Italy, Germany seeks factory or firm interested in license-rights or private person as financial partner. Write stating full particulars to Box 2112, Modern Plastics.

FOUR-STORY, BRICK BUILDING: approximately 14,000 sq. ft.; sprinkler system; Otis freight elevator; private parking lot; a whisper from down town; ideal for plastic plant; through shipping for eastern and western points; wonderful climate. For details write Box 7435 or phone 3-4035—Asheville, N. C.

REPRESENTATIVES: Are you looking for Canadian Representation? Canadian Company, well connected, desires additional plastics or affiliated products line, presently selling rigid Vinyl sheet and looking for exclusive agencies for Canada—rods, tubes, etc. Reply Box 2136, Modern Plastics.

All classified advertisements payable in advance of publication.
Closing date: 28th of second preceding month, e.g., March 28th for May issue

NEW RATES: EFFECTIVE MARCH ISSUE

Per inch (or fraction) ..... $20.00. Per inch (or fraction) boxed ..... $30.00.

For purposes of establishing rate, figure approximately 50-55 words per inch.

For further information address Classified Advertising Department,
Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.

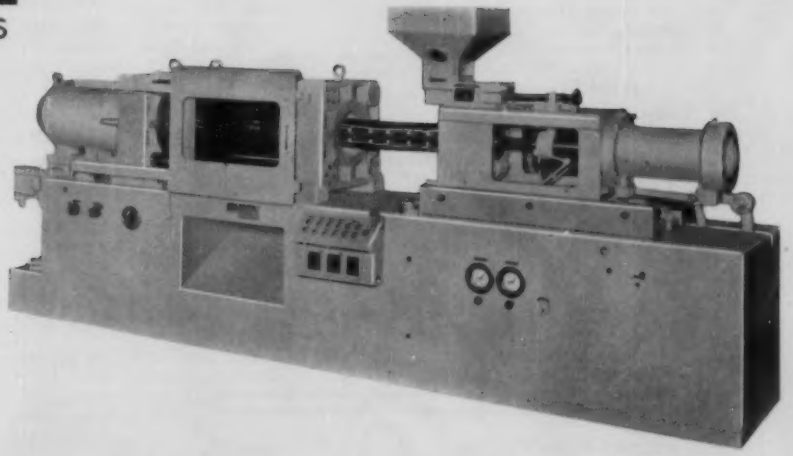
injection plastic MOLDING MACHINES

features

- ✓ Fully automatic horizontal type.
- ✓ Straight hydraulic clamping.
- ✓ No need of hazardous adjustment of stay nuts.
- ✓ Long straight heating cylinder allows quick and uniform plasticizing.
- ✓ Special clamping of heating cylinder makes exchange possible in but a few minutes.

MEIKI
MACHINES

MEIKI



MEIKI CO., LTD.
1, 2-chome, Shioiri-cho
Mizuho-ku, Nagoya, Japan

FIVE MEIKI INJECTION MOLDERS, 3 TO 80 OZ., EXHIBITED AT TOKYO INTERNATIONAL TRADE FAIR, 5 - 19 MAY, 1957

Index of Advertisers

April 1957

Modern Plastics, 575 Madison Avenue, New York 22, N. Y.

157 Acheson Dispersed Pigments Co.
228 Acromark Company, The
87 Adamson United Company
275 Advance Solvents & Chemical, Division of Carlisle Chemical Works, Inc.
63 Aetna-Standard Engineering Co., The
215 Allegany Instrument Co., Inc.
Allied Chemical & Dye Corp.
281 Barrett Div.
185 National Aniline Div.
22 Allis-Chalmers, Industrial Equipment Div.
159, 164, 165 American Cyanamid Company, Plastics & Resins Division
233 American Insulator Corp.
251, 264 American Molding Powder And Chemical Corporation
83 American Plastics Corp., A Subsidiary of Heyden Chemical Corporation
272 American Pulverizer Company
50 American Steel Foundries, Elmes Engineering Division
76 Angier Adhesives, Div. of Interchemical Corp.
243 Archer-Daniels-Midland Co.
244 Atlas Electric Devices Co.
77 Atlas Powder Company, Chemicals Division

69 B.I.P. Engineering, Ltd.
44A Badische Anilin- & Soda-Fabrik AG.
151-153 Bakelite Co., A Div. of Union Carbide and Carbon Corp.
162 Baldwin-Lima-Hamilton Corp., Hamilton Div.
6 Ball & Jewell, Inc.
139 Barber-Colman Company, Wheelco Instruments Div.
281 Barrett Division, Allied Chemical & Dye Corp.
230 Battenfeld
194 Becker & Van Hullen
44 Bethlehem Steel Company
71 Blaw-Knox Company, Chemical Plants Division
30 Boonton Molding Co.
199 Borco Chemicals
91 Borg-Warner, Marbon Chemical Division

288 Cadet Chemical Corp.
7 Cadillac Plastic & Chemical Co.
154 Carbide and Carbon Chemicals Co., A Division of Union Carbide and Carbon Corp.
238 Carroll, J. B., Company
234 Carver, Fred S., Inc.
1 Catalin Corp. of America
Celanese Corp. of America
260 Export Division
8, 9 Plastics Division
73 Chemore Corporation
4 Chicago Molded Products Corp., Campco Division
212 Cincinnati Milling Machine Co., The
35 Claremont Pigment Dispersion Corp.
276 Claremont Waste Mfg. Co.
278 Classified
214 Cleveland Process Co., The
60 Coast Mfg. & Supply Co.
70 Columbian Carbon Company
38 Commercial Plastics & Supply Corp.
277 Conforming Matrix Corp.
259 Continental Carbon Company

34 Crucible Steel Co. of America
16 Cumberland Engineering Co., Inc.

52 Dake Corporation
264 Daniels, T. H. & J., Ltd.
227 Davis, Joseph, Plastics Co.
179 Dawson, F. C., Engineering Co.
263 Dayton Rogers Mfg. Co.
202 Deecy Products Co.
29 De Mattia Machine and Tool Co.
213 Detroit Macoid Corporation
28 Detroit Mold Engineering Co.
187 Dexter, C. H., & Sons, Inc.
58, 290 Diamond Alkali Company
200 Doven Machine & Engineering Co.
271 Dow Chemical Company, The
197 Dunning & Boschert Press Co., Inc.
10, 11 du Pont de Nemours, E. I., & Co. (Inc.), Polychemicals Dept.
2nd Cover Durez Plastics Division, Hooker Electrochemical Co.

141 Eastman Chemical Products, Inc.
207 Eastman Kodak Company, Cellulose Products Div.
84 Egan, Frank W., & Company
50 Elmes Engineering Div., American Steel Foundries
92 Emery Industries, Inc.
167 Emhart Manufacturing Co., Henry & Wright Division
173 Enjay Company, Inc.
221 Erie Plastics Division, Erie Resistor Corp.
201 Escambia Chemical Corp.

64A Farbwerke Hoechst AG.
169 Farrel-Birmingham Co., Inc., Watson-Stillman Press Div.
277 Federal Tool Corporation
199 Ferro Corporation, Color Division
253 Fiberfil, Inc.
211 Fiore, Wm. M., Inc.
47 Firestone Plastics Company, Chemical Sales Division
27 Foster Grant Co., Inc.
191 Fostoria Pressed Steel Corp.

196 Geissel Mfg. Co., Inc.
46 General American Transportation Corp., Parker-Kalon Division
81 General Dyestuff Company
4th Cover General Electric Company
177 General Roll Leaf Mfg. Co.
86 General Tire & Rubber Co., The, Chemical Division
64 Georgia Kaolin Company
42 Gering Products, Inc.
267 Glass Yarns and Deeside Fabrics Ltd.
249 Glidden Company, The, Industrial Finishes Div.
3 Goodrich, B. F., Chemical Co.
14, 15 Goodyear Tire & Rubber Company, The
18 Grace, W. R., & Co., Polymer Chemicals Div.
190 Greater Miami Industrial Div.
192 Gries Reproducer Corp.
236 Guild Electronics, Inc.

63 Hale and Kullgren, Inc.
162 Hamilton Div., Baldwin-Lima-Hamilton Corp.
149 Hannifin Corp.
224 Harchem Division, Wallace & Tiernan, Inc.
218 Harshaw Chemical Co., The
217 Hartig Engine & Machine Co.
83 Heyden Chemical Corp., American Plastics Corp. Subsidiary
216 Hinde & Dauch
281 Hommel, O., Co., The
2nd Cover Hooker Electrochemical Co., Durez Plastics Div.
266 Hyde, A. L.
21 Hydraulic Press Mfg. Co., The, A Div. of Koehring Co.

171 Imperial Chemical Industries Ltd., Plastics Division
59 Improved Machinery Inc.
228 Industrial Heater Co., Inc.
244 Industrial Research Labs.
263 Industrial Solvents & Chemicals, Inc.
20, 273 Injection Molders Supply Co.
Interchemical Corp.
76 Angier Adhesives Div.
57 Finishes Div.
191 Interplastics Corporation

280 Johnson Machinery Co.

194 Karlton Machinery Corp.
223 Kaufman Glass Company, Plastics Division
264 Kingsley Stamping Machine Co.
187 Kohnstamm, H., & Co. Inc.
66, 67 Koppers Company, Inc., Chemical Division
17 Kurz-Kasch

80 L•O•F Glass Fibers Co.
78 Lembo Machine Works, Inc.
266 Lemmon and Snoap
31 Lester-Phoenix, Inc.
232 Liberty Machine Co. Inc.
192 Litzler, C. A., Co., Inc.
90 Lombard Governor Corp.
190 Lucidol Division, Wallace & Tiernan, Inc.

190 Mack Molding Company, Inc.
203 Makray Manufacturing Co.
225, 226 Manufacturers' Literature
144 Marblette
91 Marbon Chemical, Division of Borg-Warner
245 Markem Machine Co.
199 Mayflower Electronic Devices Inc.
234 Mearl Corporation, The
272 Mears Kane Ofeldt Inc.
285 Meiki Co., Ltd.
197 Merck & Co., Inc., Chemical Division
281 Metals Disintegrating Co., Inc.
211 Metalsmiths
237 Metasap Chemical Co., A Nopco Subsidiary
235 Minerals & Chemicals Corporation of America
13 Modern Plastic Machinery Corp.
265 Mol-Rez Division, American Petrochemical Corp.
269 Monsanto Chemical Company, Plastics Division
270 Mosinee Paper Mills Co.
178 Moslo Machinery Company
33 Muehlstein, H., & Co. Inc.

267 Nash, J. M., Company
185 National Aniline Div., Allied Chemical & Dye Corp.

Why use this much heat

when this [redacted] is all you need?

See the difference . . . save the difference

with CHROMALOX

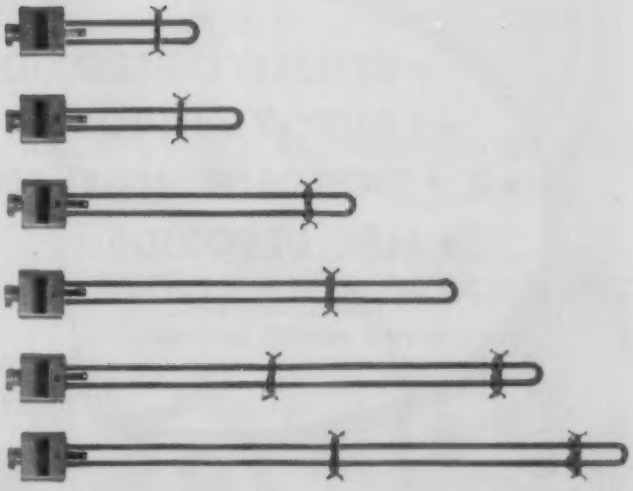
adjustable-area Far-Infrared Heaters

The new Chromalox URAD heater lets you match your heat source to your work size, in vacuum forming, embossing, resin finishing and curing, vinyl fusing, and post forming operations. Into one basic housing you can install up to 27 different heated lengths, which can be varied with the size of the work.

You can do-it-yourself too. Chromalox Far-Infrared elements are designed with a sliding fit that lets you interchange elements anywhere along the housing length. No more wasted heat when you go from one work size to another.

This new Chromalox Far-Infrared versatility means real dollars and cents savings along with the built-in advantages of Chromalox Far-Infrared: metal-sheathed, unbreakable element; infinitely variable output; high intensity, color-blind and uniform radiation.

Your Chromalox representative can give you detailed suggestions of the application of new Chromalox adjustable Far-Infrared Heaters. Or, write us for a copy of Bulletin CS-607.



CHROMALOX — FIRST NAME IN ELECTRIC HEAT

Edwin L. Wiegand Company

7503 Thomas Boulevard
Pittsburgh 8, Pennsylvania

8-728

277 Conforming Matrix Corp.
259 Continental Carbon Company
162 Hamilton Div., Baldwin-Lima-Hamilton Corp.
183 National Aniline Div., Allied Chemical & Dye Corp.

65 National Lead Company
74, 75 National Rubber Machinery Co.
147 Naugatuck Chemical Div., United States Rubber
219 Negri Bossi & Co.
247 Newark Die Company
82 Newbury Industries
198 Niagara Blower Company
51 Nixon Nitration Works
237 Nopco, Metasap Chemical Co. Subsidiary
85 Norton Laboratories, Inc.
232 Olsenmark Corporation
236 Orange Products, Inc.
161 Owens-Illinois
283 P. & H. Enterprises
206 Packaging Industries
276 Pantex Manufacturing Corp.
181 Parker Appliance Co., The., Rubber Products Division
46 Parker-Kalon Div., General American Transportation Corporation
220 Paterson Parchment Paper Co.
196 Perforating Industries, Inc.
231 Permanent Label Corporation
179 Peter Partition Corp.
186 Peterson, A. W., & Sons Die Company, Inc.
53, 56 Phillips Chemical Company
189 Pitt-Consol Chemical Co.
3rd Cover Pittsburgh Coke & Chemical Co.
40 Pittsburgh Plate Glass Co., Selectron Products Div.
210 Plandex Corporation
23 Plastics Engineering Company
177 Precision Mold & Polishing Corporation
231 Premier Vacuum Process Corp.
234 Price-Driscoll Corp.
205 Quinn-Berry Corp.
274 Radial Cutter Mfg Corp.
222 Radio Corp. of America
25 Radio Receptor Co., Inc.
175 Reichhold Chemicals, Inc.
19 Reifenhauser, A.
211 Resin Research Labs, Inc.
48 Robbins Plastic Machinery Corp.
239 Robertson, H. H., Co.
134, 135 Rohm & Haas Company
223 Rubber Corp. of America
209 Safety Industries Inc., Entoleter Division
49 Schulman, A., Inc.
194 Schulz, Richard O., Co.
45 Schwartz Chemical Co., Inc.
262 Scranton Plastic Laminating Corp.
242 Sealomatic Electronics Corp.
204 Seiberling Rubber Company, Plastics Division
32 Shaw, Francis, & Co. Ltd.
36 Shell Chemical Corporation
187 Sinko Mfg. & Tool Co.
240, 241 Socony Mobil Oil Co., Inc.
229 Solvic S. A.
61, 62 Spencer Chemical Company
130, 131 Stokes, F. J., Corp.
257 Swedlow Plastics Co.
222 Thoreson-McCosh, Inc.
279 Tinnerman Products, Inc.
68 Titanium Pigment Corp.
12 Transilwrap Company
72 Tupper Corporation
Union Carbide and Carbon Corporation
151-153 Bakelite Company Div.
154 Carbide and Carbon Chemicals Company Div.
216A, 216B Union Carbide International Company Div.
79, 208 U. S. Industrial Chemicals Co.
147 United States Rubber. Naugatuck Chemical Div.
183 Van Dorn Iron Works Co., The
88, 89 Waldron, John, Corporation
Wallace & Tiernan, Inc.
224 Harchem Division
190 Lucidol Division
195 Watertown Mfg. Co., The
169 Watson-Stillman Press Div., Farrel-Birmingham Co., Inc.
122 Welding Engineers, Inc.
26 Wellington Sears Co.
193 West Instrument Corporation
24 Weyerhaeuser Sales Company
139 Wheelco Instruments Div., Barber-Colman Company
238 Whitlock, C. H., Associates
287 Wiegand, Edwin L., Co.
214 Williams, Gabriel, Co., Inc.
215 Williams-White & Co.
176 Wilner Wood Products Co.
259 Witco Chemical Company
245 Woloch, George, Co., Inc.
261 Wood, R. D., Company
177 Wysong & Miles Co.

MODERN PLASTICS

Published by Breskin Publications Inc., 575 Madison Ave., New York 22, N. Y.

ORGANIC PEROXIDES

• BENZOYL PEROXIDE
• LAUROYL PEROXIDE
• 2, 4 DICHLOROBENZOYL PEROXIDE
• MEK PEROXIDE

Technical Data and samples available on request.

Distributed by CHEMICAL DEPT. of McKESSON & ROBBINS, INC.
155 East 44th St., New York 17, N. Y.
Warehouse Stocks in Principal Cities

Manufactured by CADET Chemical Corp.
Burt 1, New York
Trade Mark

This guide to profits in the packaging field is another exclusive MODERN PACKAGING service for advertisers. And *only* MODERN PACKAGING—with research and editorial facilities unmatched in the field—could do this big job. File size, its 44 pages are packed with data on the market and the magazine. Send for . . .

Where does your product fit in the growing packaging field?

If you're looking for new markets for your product—don't miss the packaging field! And if you're already selling to packagers—don't overlook this opportunity to sell *more!* Almost daily, previously unpackaged items such as sheets, shirts, fresh produce, meats, poultry, hardware, are being sold in containers. And sales of everything that packagers use from boxboard to bags, from ampules to adhesives, are *booming!*

So the chances are good that your product—whether it's packaging machinery, materials, supplies or containers—can hit big volume in the packaging field. To find out where *your* product fits in best, be sure to send for . . .

YOUR FREE COPY OF "THE PACKAGING FIELD AND HOW TO REACH IT"

MODERN PACKAGING
575 Madison Avenue, New York 22, N. Y.

Gentlemen:
Please rush my free copy of your 44 page data file, "The Packaging Field . . . and how to reach it."

NAME _____
COMPANY NAME _____
PRODUCT _____
STREET _____
CITY _____ ZONE _____ STATE _____

New PVC compound stops corrosion!

Discover how rigid polyvinyl chloride pipe, valves and fittings can cut your plant's share of the nation's annual bill for battling corrosion—a staggering $6 billion! You can save on maintenance costs and reduce shutdowns caused by either internal or external corrosion.

Injection molded from a *special, newly developed* DIAMOND PVC rigid compound—the lightweight valve you see above* will resist attacks by weather and a wide range of acids, alkalies, salt solutions, alcohol, and other chemicals.

Easy to install, it's nontoxic, nonsparking and nonflammable. And its smooth inside surface lowers flow resistance and prevents deposit build-ups. Temperature limit for continuous service is 165° F.

Experience further demonstrates that polyvinyl chloride compounds based on this new DIAMOND development are ideally suited to molding operations.

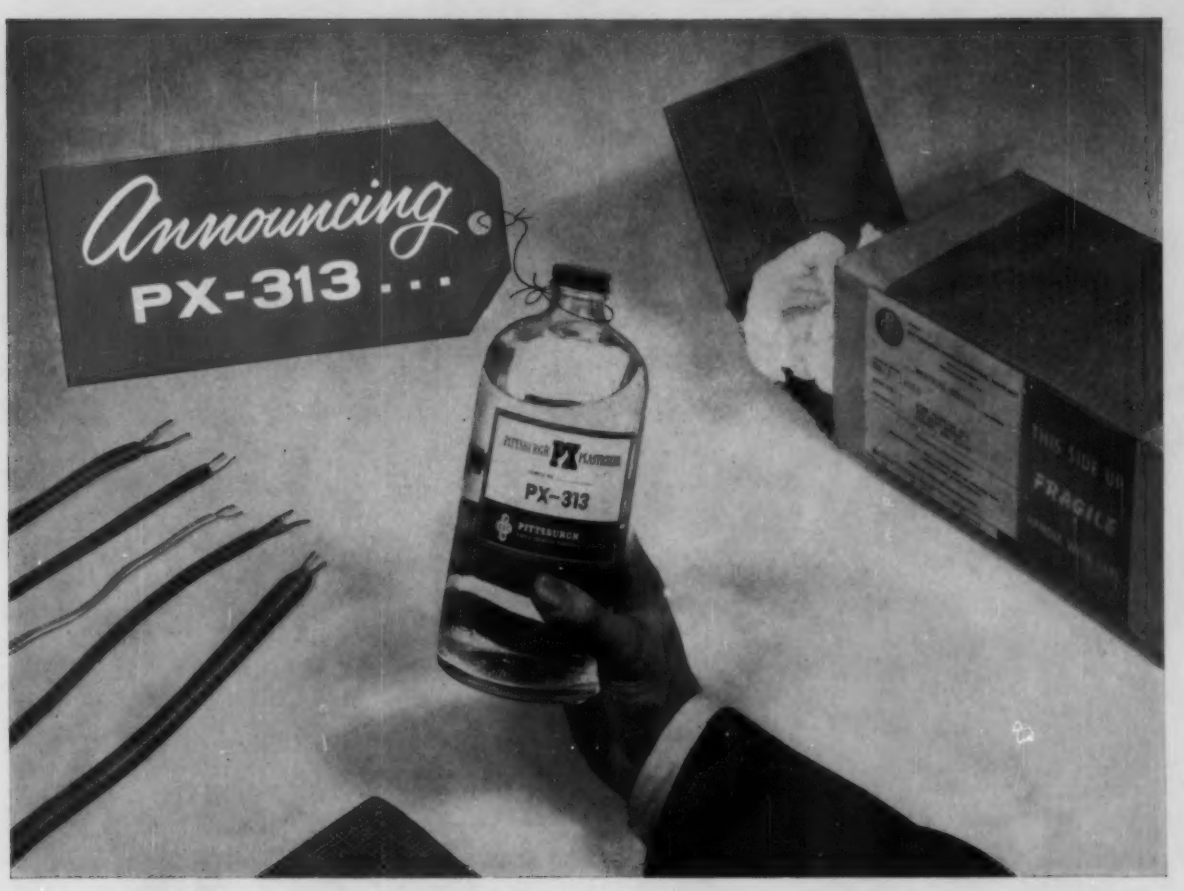
For full information on this remarkable new rigid compound, call or write DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

*Produced by Tube Turns Plastics, Inc. Louisville, Kentucky. DIAMOND does not make PVC pipe, valves or fittings.

DIAMOND ALKALI CHEMICALS

Diamond Chemicals

CITY _____ ZONE _____ STATE _____



. . . Pittsburgh's New Primary Plasticizer!

HERE is a completely new Pittsburgh Plasticizer that may enable you to realize important cost reductions if your production requires a primary plasticizer with excellent low temperature flexibility, low volatility and good processing characteristics.

A modified alkyl phthalate, PX-313 imparts a low temperature flexibility in vinyls equivalent to that obtained with normal octyl-normal decyl phthalates, but at appreciably lower plasticizer cost.

PX-313 is thus ideal for high quality coated fabrics, sheeting and film. Its low volatility and excellent heat stability make it equally suitable for vinyl-jacket wire and other extruded products where elevated processing temperatures are encountered. And because of the good initial viscosity characteristics and excellent shelf life PX-313 provides, it is considered excellent for use in plastisols.

If the economics of this newly developed Pittsburgh Plasticizer seem to offer potential advantages in your operations, *we invite you to send for a sample and data file today.*

Send for your Free Data File and Sample!

PX-313 Data File contains comprehensive reports on specifications, physical properties and performance characteristics. Sample and data file sent without obligation.

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Phenolic Products salutes molding industry

demand for electrical power

TO DOUBLE IN 8 YEARS

TO QUADRUPLE IN 16 YEARS

Phenolic Molders Cited for Helping Electrical Industry Meet Unprecedented Expansion

The success of phenolic molders in helping the electrical industry keep pace with its unprecedented expansion was hailed by industry spokesmen during National Electrical Week, just past. With the help of new phenolic materials and improved molding techniques, the electrical industry now expects to meet electrical power needs that will double within the next eight years, quadruple in the next sixteen.

Today, more than a third of all molded phenolic products are serving in electrical applications. And with good reason: Phenolics are prime insulating materials; they withstand heat; they are easily handled and molded; they can take severe mechanical abuse; and by no means least, phenolic molders themselves have contributed design and production innovations that have added greatly to the economic success of phenolics' use in the electrical industry.

We of the Phenolic Products Section at General Electric would like to add our own congratulations to the phenolic molders for the job they are doing. As a leading manufacturer of phenolic molding compounds, G.E. is proud to have a stake in this excellent future growth. General Electric Company, Section MP-4, Chemical Materials Dept., Pittsfield, Mass.

Progress Is Our Most Important Product

GENERAL ELECTRIC